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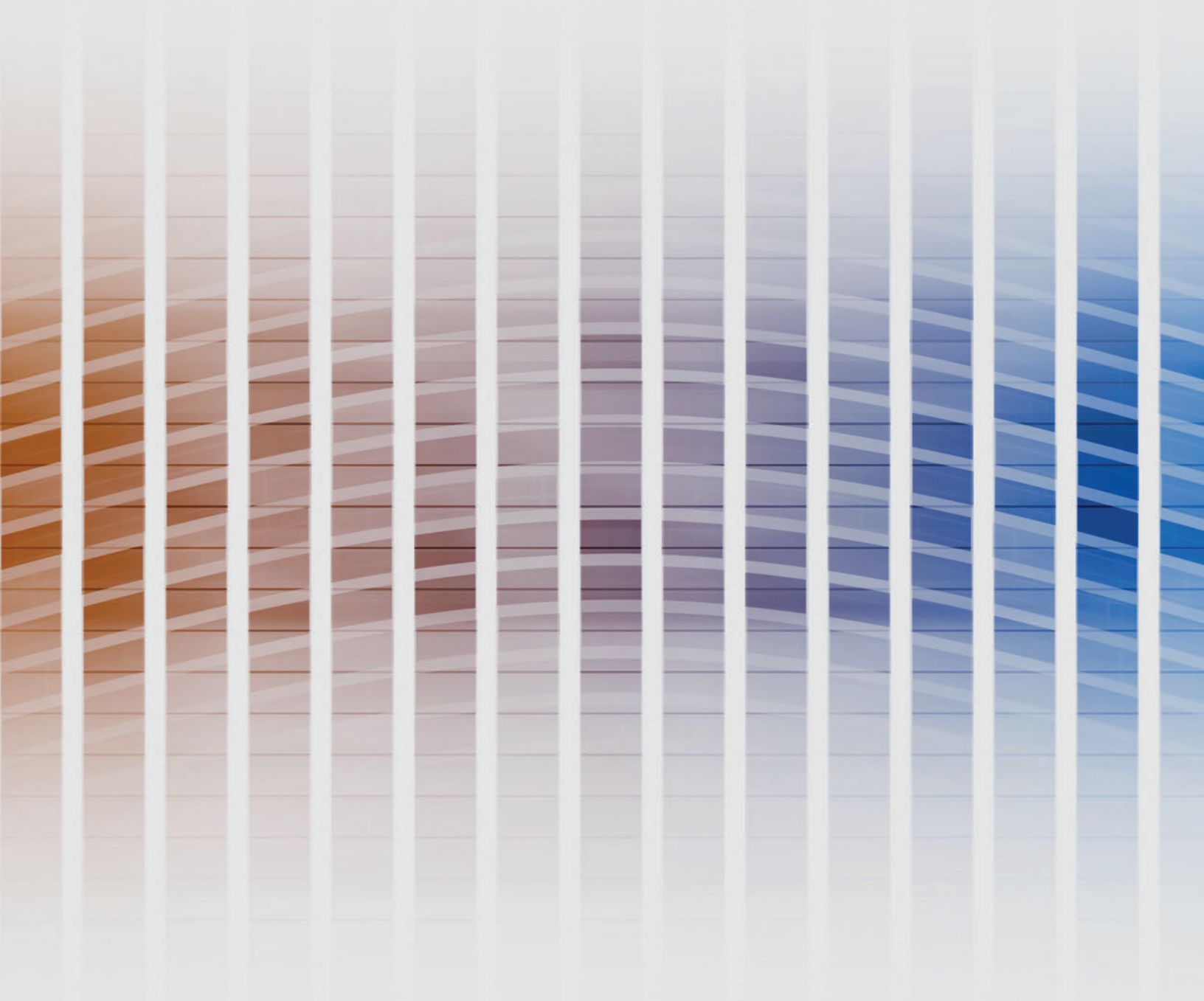
Corporate publications are program or department brochures, newsletters, pamphlets, and miscellaneous information about the RAND Corporation or RAND's business units. Some corporate publications are published in the AR series as Annual Reports or as Administrative Reports. Administrative Reports are often required by the client or sponsor and provide a status report on work resulting from a contract.

Annual Report
2011–2012



RAND NATIONAL SECURITY RESEARCH DIVISION

Annual Report
2011–2012

NATIONAL SECURITY RESEARCH DIVISION

Contents

Director's Message

Eric Peltz, Associate Director; Jack Riley, Director; Nancy Pollock, Director, Operations and Planning, NSRD

Any budgetary cuts, dramatic or modest, will occur at a time when DoD confronts great challenges.

A third of the way into the current decade, the U.S. Department of Defense (DoD) finds itself at a turning point: The U.S. presence in Afghanistan has begun winding down, and what is now a 12-year epoch in U.S. military objectives and operations is coming to a close. During that time, the focus has been on counter-insurgency and stability operations in the Middle East. Some capabilities in these areas will be retained, but the new DoD strategic guidance suggests that the Asia-Pacific region will command more equivalent attention.

At the same time, DoD may have to lower its budget beyond what is specified in the current reduction plan. Should that transpire, the decrement could be enough to require reductions in force structure that would necessitate revisions to strategic priorities or make it difficult to execute all the missions judged important for national security. In particular, in the absence of a bipartisan plan for federal spending constraints over the long term, arbitrarily large cuts in defense may take effect automatically.

Any cuts, dramatic or modest, will occur at a time when DoD confronts great challenges. For example, there will be a need to replace equipment that has experienced a decade of wear in Iraq and Afghanistan. Meanwhile, force structure elements that are less important in the Middle East will have to be built up to meet new challenges in the Asia-Pacific region.

The need to realign the force structure under budgetary pressure will strongly motivate DoD to maximize the value per dollar spent. To fund all desired capabilities, DoD will be looking hard for ways to economize on platforms, operational tempo, and personnel. The perennial topic of acquisition reform will assume new urgency, force structure plans will be examined critically for linkages to the strategic guidance, and a window of opportunity for compensation reform may open.

The RAND National Security Research Division (NSRD) is well placed to aid DoD's leadership in exploring options for guiding the evolution of force structures to meet threats while recognizing economic constraints. NSRD's federally funded research and development center (FFRDC), the National Defense Research Institute (NDRI), has 28 years of experience supporting senior DoD decisionmakers

through widely varying eras. Some aspects of the agenda—e.g., manpower and technology evaluation—go back even further at RAND.

Recent or ongoing projects address such key elements of the new strategic guidance as security force assistance, long-range strike, and countering anti-access/area denial practices. If stability campaigns give way to an emphasis on high-intensity expeditionary operations, NSRD can draw on a long institutional memory of analyses supporting such operations, both through NDRI and through RAND's two other FFRDCs. For example, current NDRI projects are helping DoD rethink global force postures, building on both past research and recent capabilities developed in other FFRDC projects. If some defense assets are to be reduced, NDRI can draw on past and current work on ways to manage a drawdown.

Limiting cost growth may warrant a consideration of ways to constrain the growth in benefits to military personnel and their families. Such assessments are likely to be sensitive and controversial; NDRI has built a record of serving as a reliable, careful, objective source of analysis on personnel issues, such as compensation reform and sexual orientation in the military.

As the security environment changes, NDRI builds new capabilities. These are particularly needed in the rapidly evolving technology domain, with respect to both military and commercial advances that may soon find use on the battlefield—in DoD's hands, if not in those of the enemy as well. To explore the potential of information operations and cyber tools against terrorism, NDRI is building further expertise in coordination with RAND's other FFRDCs.

As the security environment changes, NDRI builds new capabilities.

This volume presents selected examples of projects recently completed or still in progress within each of NSRD's five research centers—plus RAND's International Programs. The contributions of these projects to informing national security policymaking include the following:

International Security and Defense Policy

- Identified ways to support the involvement of the naval forces of partner countries in maritime irregular warfare operations (page 10).
- Pointed out approaches that the United States could use to help Israel and Iran avoid military conflict (page 12).
- Outlined realistic U.S. objectives and expectations from multiparty negotiations with the Taliban, the Afghan government, and other stakeholders (page 15).
- Identified economic and security functions that the United States might support in nations on the path from insurgency to stability (page 18).

Acquisition and Technology Policy

- Identified the number and scope of acquisition programs necessary to sustain a military aircraft industry (page 22).
- Drew lessons from submarine design and acquisition programs across three countries to provide an experience base for new program managers (page 23).
- To assist with reporting to Congress, conducted rapid analyses of root causes of problems in major defense acquisition programs (page 25).
- Characterized the workforce required for Australia to design its next submarine class and the means for achieving such a workforce (page 28).
- Proposed ways to tailor standard acquisition policies to better account for the special characteristics of ship programs without compromising oversight (page 31).

Forces and Resources Policy

- Devised a needs-centered framework for evaluating DoD efforts to support military families (page 35).
- Suggested an approach that could help managers foster a greater emphasis on in-sourcing in current DoD work allocation policy (page 36).

- Quantified the extent to which deployment durations exceed DoD guidelines and reviewed ways to reduce the excesses (page 38).
- Catalogued DoD programs addressing psychological health and traumatic brain injury and identified challenges to program effectiveness (page 41).
- Quantified the role of defense spending in Hawaii's economy (page 44).

Intelligence Policy

- Informed counterinsurgency assessment doctrine that shifts the emphasis from aggregated metrics to contextual narratives built up from the battlefield level (page 48).
- Identified successes and shortcomings in U.S. military information operations in Afghanistan through 2010 (page 50).
- Identified ways to improve the structure of U.S. Marine Corps intelligence functions (page 53).
- Suggested approaches that could be taken to promote the reintegration of Afghan insurgents into society (page 56).

Homeland Security and Defense

- Examined cost uncertainty, deterrence, and other issues often overlooked in analyzing the costs and benefits of aviation security measures (page 60).
- Explored new statistical measures for aiding decisions regarding where to position border patrol personnel and equipment (page 62).

International

- Outlined the interests and intentions of military leaders in post-revolutionary Egypt (page 66).
- Assessed the benefits and risks of Chinese investments in U.S. firms and proposed a decision model for the analysis of specific cases (page 68).

RAND's value to U.S. defense, intelligence, and homeland security leaders has been well established over the decades. NSRD's utility in identifying and evaluating options for cost-effectively achieving security-related objectives and missions is especially valued when resources are constrained, as they are likely to be at least for the near future. Furthermore, RAND's cardinal values of quality, objectivity, and independence are always timely. We are confident that the coming years will only add to RAND's record of savings and value added to the decisionmaking process in DoD and other U.S. and allied national security organizations.

Jack Riley
Vice President, RAND Corporation
Director, National Security Research Division
Director, National Defense Research Institute

Overview

The RAND National Security Research Division (NSRD) conducts research on complex national security problems with an emphasis on the most pressing and difficult strategy and policy concerns of high-level policymakers and their staffs. NSRD provides independent and objective analytical support to decisionmakers in the U.S. Department of Defense (DoD) and elsewhere in the wider national security and intelligence communities, both in the United States and abroad, by

- developing innovative solutions to complex problems using multidisciplinary teams of researchers
- providing practical guidance and clear policy choices while also addressing barriers to effective implementation
- meeting the highest research standards using advanced empirical methods and rigorous peer review
- maintaining independence and objectivity by scrupulously avoiding partisanship and vested interests
- serving the public interest by widely disseminating its research publications (subject to the constraints of national security) and encouraging staff to participate in public forums.

The RAND National Defense Research Institute

NSRD includes the RAND National Defense Research Institute (NDRI), established in 1984 as a federally funded research and development center (FFRDC) sponsored by the Office of the Secretary of Defense (OSD), the Joint Staff, the unified combatant commands, the defense agencies, and the defense Intelligence Community (IC). Through OSD, NDRI also performs research for the U.S. Navy and the U.S. Marine Corps. The multiyear FFRDC contract, coupled with NDRI's broad sponsorship and its sponsors' appreciation of its objectivity and independence, allows the institute to

- conduct a continuous, integrated research and analytic program with particular emphasis on enduring issues that cut across organizational boundaries
- look to the future, maintaining a mid- to long-range focus together with a quick-response capability.

In support of these goals, and by virtue of its 28-year relationship with DoD, NDRI has

- accumulated an in-depth understanding of DoD and its needs
- developed a staff that balances the breadth and depth of technical expertise needed to address the complex issues faced by its sponsors
- supported the development and sustained the currency of an advanced suite of models and other tools that facilitate the analysis of issues across the defense policy spectrum.

It is noteworthy that, to perform research requiring access to proprietary and other sensitive information not generally accorded commercial contractors, NDRI stays strictly independent of proprietary interests, in keeping with its FFRDC charter.

Research Centers and Agenda

Up through fiscal year 2009 (FY09), NSRD's research was largely conducted in four centers:

- International Security and Defense Policy Center (see p. 8)
- Acquisition and Technology Policy Center (see p. 21)
- Forces and Resources Policy Center (see p. 34)
- Intelligence Policy Center (see p. 47).

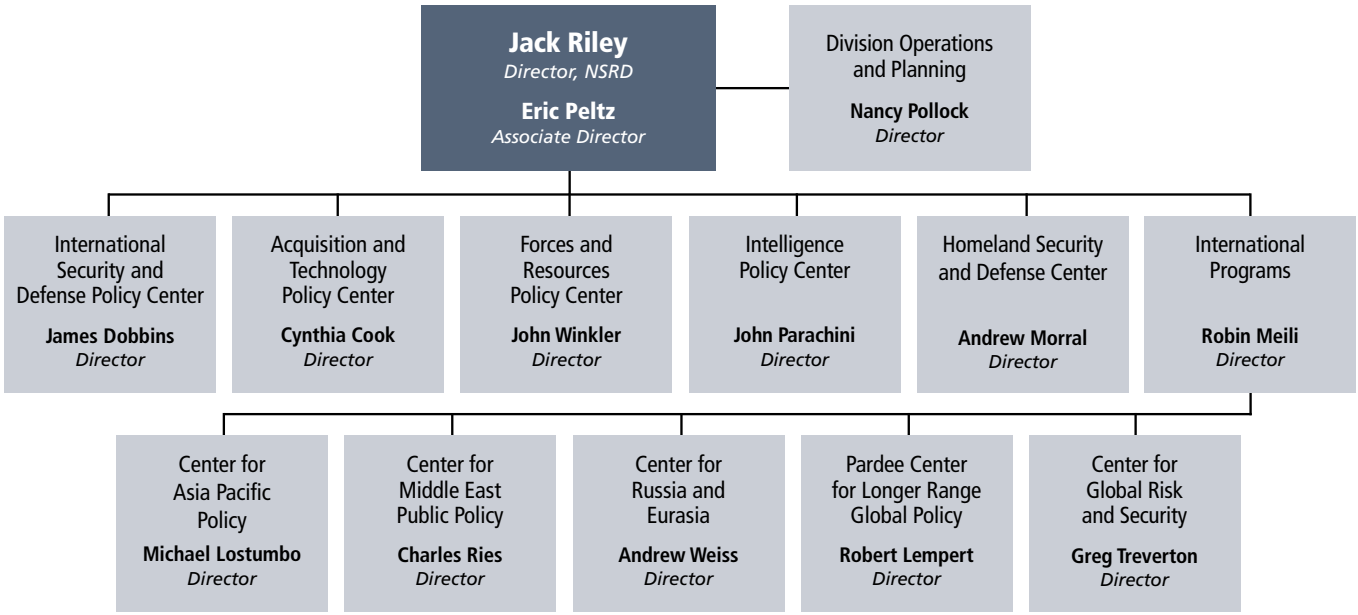
These centers correspond in scope to the purviews of the four under secretaries of defense whom NSRD is most often called upon to support. Most of the work conducted by these centers, taken together, is carried out within NDRI. However, the centers also perform research for non-DoD sponsors in the IC, the U.S. Department of State, allied governments and their ministries of defense, various foundations, and other organizations (see pp. 74-75).

At the beginning of FY10, NSRD assumed oversight of the RAND Homeland Security and Defense Center (see p. 59), in collaboration with RAND Infrastructure, Safety, and Environment. The center carries out research under the sponsorship of the federal departments of Homeland Security, Defense, and Justice, as well as other organizations charged with security and disaster preparedness, response, and recovery, within the United States and internationally.

Through the period covered by this annual report, NSRD also housed RAND's International Programs (see p. 65), which facilitates the growth and understanding of RAND's internationally focused research, particularly that funded by non-DoD and non-IC sponsors (such as allied governments, foundations, and private contributors). Because this research lies at the intersection of international policy and transnational trade, education, health care, information technology, and energy and the environment, it has often been carried out by other RAND units, though some has been conducted within NSRD. As of the spring of 2012, International Programs no longer reports through NSRD but rather through the newly created position of Vice President, International.

To expand knowledge on emerging issues that are of potential concern to the national security community but currently have no specific sponsor, and to expand the state of the art in analytic methodologies, RAND supports some NSRD research through its own discretionary funds. The latter are derived from fees earned on client-funded research, independent research and development funds provided by DoD, and unrestricted private donations.

The research agenda of NSRD and NDRI emerges from relationships with clients that are long-standing, mutually reinforcing, and dynamic. NSRD and its



FFRDC help their sponsors identify and evaluate new policies, frame alternative ways to implement current policies, and provide other analytic and technical assistance. That assistance includes helping decisionmakers develop political and technological responses to evolving terrorist threats, sustain a robust all-volunteer force, reform intelligence collection and analysis, and set other policy directions serving U.S. security interests. At the same time, NDRI acts to sustain and invigorate its core investigational, theoretical, and methodological capabilities—the institutional foundations that will enable it to address pressing national security concerns for years to come.

The RAND Environment

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. Since its founding in 1948, RAND has studied the most pressing problems of the day, producing in-depth, objective analyses; basic and applied research; and analytic tools used in government, academia, and the private sector.

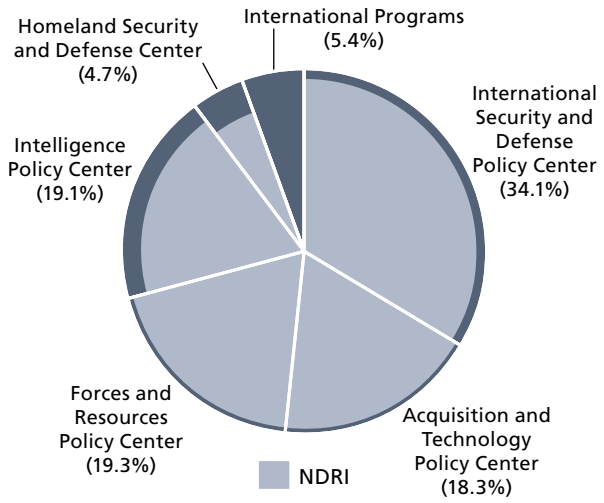
Policymakers rely on RAND for help in analyzing choices and developments in many areas, including national defense and homeland security, health care, labor and population, education, civil justice, public safety, and the nation's infrastructure and environment. RAND also offers several advanced training programs: the Pardee RAND Graduate School's doctoral program in policy analysis and the military fellows programs, which sponsor one-year tours at RAND by mid-career officers in the military services and the Coast Guard.

In addition to NDRI, RAND houses two other FFRDCs offering additional analytic resources to DoD:

- RAND Project AIR FORCE—RAND's oldest studies and analysis organization—focuses on issues of enduring concern to U.S. Air Force leaders, such as the role of air and space power in the future security environment, force modernization to meet changing operational demands, workforce characteristics and management, and acquisition and logistics cost control.[1]
- The RAND Arroyo Center, as the U.S. Army's only studies and analysis FFRDC, also emphasizes mid- and long-range policy questions while helping the Army improve efficiency and effectiveness, providing short-term assistance on urgent problems, and serving as a catalyst for needed change.[2]

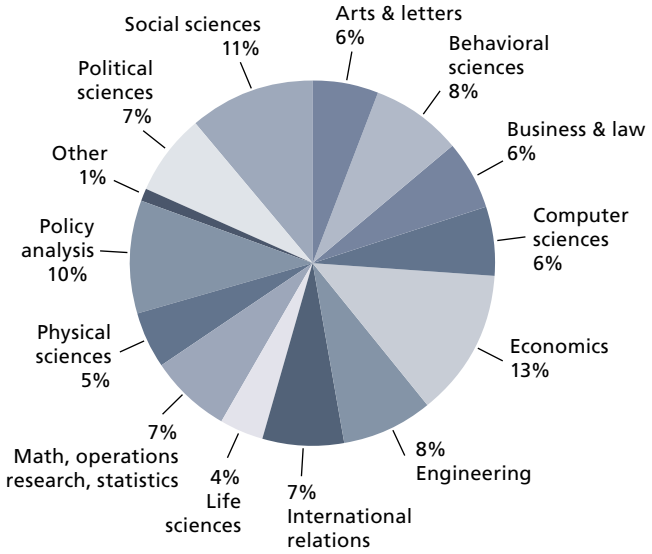
Policymakers rely on RAND for help in analyzing choices and developments in many areas.

NSRD Revenues by Organizational Element, FY11
(Total $54.4 million)



The NSRD research agenda is balanced across major issue areas.

Percentage of staff with degree in



RAND's multidisciplinary staff provide breadth and depth to research activities.

Offices in Europe and the Middle East provide international reach and perspective.

RAND has a matrix-type organization. Research units such as NSRD administer the research programs; the corporation, through the office of the Vice President, Global Research Talent, recruits, develops, and evaluates the staff, in consultation with the units. Approximately 1,900 people work at RAND, representing diversity in work experience, academic training, political and ideological outlook, and race, gender, and ethnicity. Approximately 90 percent of the research staff hold advanced degrees, with two-thirds of those being doctorates.

NSRD draws on analytical talent in six RAND offices in the United States and four abroad and in a wide array of disciplines. For instance, experts in the social sciences—economists, psychologists, sociologists, and demographers—contribute to studies of personnel and intelligence issues. Work on the effectiveness of evolving military technologies draws on staff skilled in engineering, information systems, computer modeling and simulations, and scenario design and testing. Political scientists and experts in military operations conduct research on the uses and limitations of the application of U.S. military power and alternative forms of leverage in addressing threats to peace and freedom.

NSRD works with other RAND units on topics of mutual interest. For instance, RAND Health brings crucial insight from its civilian health research to questions about the provision and management of military medical services and the effects of combat duty on mental health. Research on defense issues for U.S. allies is done in part through RAND's independently chartered European subsidiary, RAND Europe. This work also provides perspective for U.S. national security issues. The RAND-Qatar Policy Institute serves as a source of analysis of the most important and difficult issues faced by public and private decisionmakers in the Middle East and neighboring areas.

Leading the Way in Defense Research and Analysis

RAND is an international leader in defense analysis. Government officials, academics, and business leaders in the United States, Europe, Asia, Australia, and the Middle East rely on RAND's advice. They turn to RAND for assistance with the complex problems they must confront. RAND has demonstrated the ability to analyze a problem, place it in the appropriate context, and identify options to help leaders make the best-informed decisions. NSRD's programs are a major component of RAND's overall success and reputation in national security research.

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1 For more information, see *Annual Report 2011*, RAND Project AIR FORCE, AR-7168-AF. Online at www.rand.org/pubs/annual_reports/AR7168.html

2 For more information, see *Annual Report 2010*, RAND Arroyo Center, AR-7157-A. Online at www.rand.org/pubs/annual_reports/AR7157.html

International Security and Defense Policy Center

James Dobbins, Director
International Security and Defense Policy Center

U.S. national security decisionmakers must meet the challenge of achieving a favorable outcome in Afghanistan in the face of a fluid security situation, complicated by Pakistan's ambiguous role. They must succeed there as they continue to address the broader threats of terrorism and the proliferation of weapons of mass destruction. Other challenges must also be faced, such as the spread of terrorism to Europe and the changing security situation in Northeast Asia. Because the United States cannot handle these issues alone, U.S. policymakers will need to continue efforts to maintain and enhance current coalitions and create new ones.

NSRD's International Security and Defense Policy Center (ISDPC) explores the implications of political, strategic, economic, and technological challenges for U.S. and international security. It assists U.S. national security decisionmakers in developing strategies and policies to manage and adapt to such challenges and to protect U.S. and allied interests at home and abroad. ISDPC helps U.S. policymakers better understand how terrorism intersects with other emerging threats in the post-9/11 world. It helps assess the efficacy of current counterinsurgency strategies and devise new ones. It investigates the sources of state failures and explores new means by which acceptable levels of governance can be assured or restored in such areas. And it explores ways of holding together the coalitions that can further U.S. interests through assistance with basing and access, participation in battle, and support for subsequent reconstruction and stability operations.

SOME RECENT AND ONGOING PROJECTS

Expanding Our Knowledge of Factors Influencing Counterinsurgency Success

In 2010, RAND released a report[3] that sought to answer the following question: When a country becomes host to an insurgency, what counterinsurgency (COIN) approaches give its government the best chance of prevailing? The study could not identify any one or a few factors most responsible for success (or failure). Instead, winning seemed associated with a broad set of approaches that almost all winners used. RAND is now revisiting this study by expanding the scope in two important ways:

- First, the number of cases examined has been expanded. The original study looked at 30 insurgencies that began and were resolved between 1978 and 2008. For the update, NDRI has expanded the list to 75 insurgencies by including numerous older cases back to World War II, as well as several others not included in the initial study. The objective is to assemble the definitive collection of modern insurgency case studies.
- Second, the researchers will assess several more hypotheses than had been tested before. The study focuses, in particular, on different levels of external participation in the conflict and the different roles of these external participants, the duration of the insurgency as a whole and of its phases, and the stability of the end state.

The ultimate goal is to identify priorities for investment in building and operating COIN capabilities and to inform operations in Afghanistan.

SPONSOR: Cost Assessment and Program Evaluation, Office of the Secretary of Defense
PROJECT LEADER: Christopher Paul

Securing Kosovo

More than a dozen years after NATO first intervened, Kosovo has developed its own state institutions and been recognized as an independent state by many countries. However, because the conflict between Kosovo and Serbia has not been fully resolved (northern Kosovo is under de facto Serb control), NATO continues to deploy more than 6,000 troops to maintain stability. Tiring of continued troop commitments and facing increasing financial pressures at home, some contributors to the Kosovo Force (KFOR) have begun urging a drawdown. At the same time, the government of Kosovo anticipates creating its own defense forces in 2013. Both of these factors suggested the need to reexamine Kosovo's security requirements and plot a path to ensure Kosovo's continued stability and gradual European integration.

Members of a KFOR quick-reaction force touch down in a UH-60 Blackhawk helicopter near Crep/Crepana, Kosovo.

Working from dozens of interviews conducted in the region and elsewhere, a review of pertinent literature, and a comparative assessment of analogous security situations in other countries, NDRI sought to answer the following overarching question: How can Kosovo's security needs be met and its legitimate defense capabilities be developed in ways that contribute to the region's stability and integration into Euro-Atlantic institutions? Breaking this question down, the research team addressed the threats to Kosovo's security, the utility of continuing the international security presence, and several issues related to the Kosovo government's security force: roles and missions, constraints and oversight mechanisms to ensure its responsible use, and management of assistance to the force so as to maintain regional stability and mitigate unintended consequences.

SPONSOR: Office of the Secretary of Defense
PROJECT LEADERS: Laurel E. Miller and Stephen Watts

International Security and Defense Policy Center

Assessing the Commander's Emergency Response Program

The Commander's Emergency Response Program (CERP) is a DoD fund that military commanders in the field can tap to support projects directed at meeting the civil needs of local populations. CERP-funded projects are predominantly small-scale, low-cost, short-term efforts oriented toward restoring essential services, building or repairing infrastructure, or generating employment.

CERP is seen as a crucial element of COIN and stability operations. However, there has been little systematic evaluation of the operational and tactical effects of CERP in COIN. Understanding the operational and tactical effects is important in establishing CERP's cost-effectiveness and in guiding future policy reforms and program implementation.

As a step toward an operational and tactical assessment, NDRI developed a comprehensive evaluation approach through (1) a review of existing analyses of CERP, (2) an examination of the extant data that could be used to support a comprehensive evaluation of CERP, and (3) a detailed case study of the use of CERP in one district during one major operation in Afghanistan; this case study included interviews with CERP implementers, a review of after-action reports, and an analysis of relevant data.

The assessment approach emerging from this planning effort has two stages. The first involves a qualitative survey (e.g., semistructured interviews) of CERP implementers. This survey will provide essential contextual data on how, why, where, and when CERP is used; it will also provide essential information on who benefits from its use and the challenges faced by the implementers. The second stage will combine the survey data with existing quantitative data to assess CERP's effectiveness. NDRI has been asked to carry out this assessment.

SPONSOR: Cost Assessment and Program Evaluation, Office of the Secretary of Defense

PROJECT LEADERS: Daniel Egel and Charles P. Ries

NATO and the Challenges of Austerity

In the coming decade, the North Atlantic Treaty Organization (NATO) can expect to face declining defense budgets: Germany will reduce defense spending by a quarter over the next four years, and the defense budgets of some of the smaller European nations have taken even larger cuts. The United States is also planning significant reductions.

These cuts have been driven almost entirely by the need to reduce large budget deficits—not by a change in the nature of external threats. The cuts have been made, moreover, with little intra-alliance coordination. If this uncoordinated process of budget cuts intensifies, NATO will lose critical capabilities—interoperability among them.

Meanwhile, the United States is giving greater priority to engagement in Asia and the Pacific. That is likely to increase pressure on European allies to take greater responsibility for providing security in areas such as the Mediterranean littoral. The planned cuts will greatly limit NATO Europe's ability to fill this role, however.

To clarify these limitations, NDRI assessed the impact of the planned defense spending cuts on the armed forces of seven key allies: Britain, France, Germany, Italy, the Netherlands, Poland, and Spain. These seven countries were selected because they account for the greatest fractions of NATO's deployable and sustainable forces.

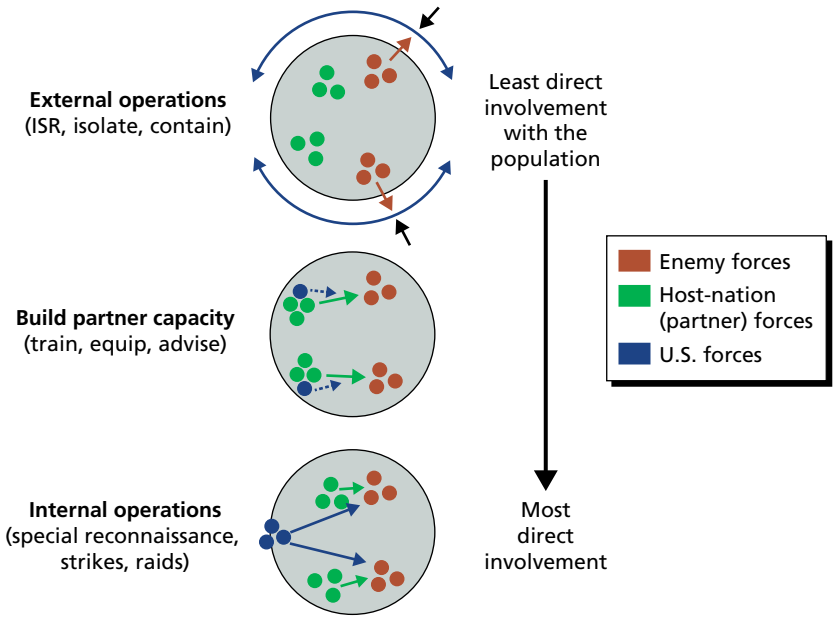
The study explored five issue areas. First, where will the cuts fall, and what impact will they have on NATO's capabilities? Second, how will the cuts affect the ability of the seven countries to contribute to specific missions, such as the defense of NATO's territory and power projection abroad? Third, what are the implications for the strategic context (e.g., the challenges the alliance might face in the coming decade)? Finally, what are the implications for the choices that U.S. policymakers face? How should they respond?

SPONSOR: Office of the Under Secretary of Defense for Policy

PROJECT LEADERS: F. Stephen Larrabee and Stuart E. Johnson

Maritime Irregular Warfare: Potential and Implications

In light of the past decade of U.S. involvement in the conflicts in Iraq and Afghanistan, the concept of *irregular warfare* (IW) has become prevalent in U.S. defense strategy and doctrine. While IW includes a variety of land-, air-, and maritime-based activities, current conceptions do not focus on the specific requirements and opportunities related to the maritime realm. Although ground forces carry out the bulk of IW activities, maritime-based forces also play an important role. NDRI carried out an analysis to describe the strategic potential of maritime IW and to assess its operational and tactical characteristics based on a



NOTE: ISR = intelligence, surveillance, and reconnaissance.

In maritime irregular warfare, three broad types of operational practices shape the maritime environment, shown here in order of degree of involvement with the partner nation's population.

sample of historical and recent maritime IW operations, including those in the Philippines. The results are intended to inform future U.S. investments in force structure and future doctrine regarding the ways in which maritime IW fits with other IW domains.

The study team reached a number of findings regarding U.S. and partner capabilities and adversary capabilities. These findings formed the basis for several recommendations for the U.S. conventional Navy and Naval Special Warfare Command. For example, U.S. naval forces should continue to provide U.S. partners with equipment that they will be able to operate and maintain. Also, U.S. naval forces may have to continue or expand training of partner forces to confront future maritime IW threats. The study also provided several broader policy-relevant recommendations. For instance, to prevent and deter maritime attack approaches such as that used in Mumbai in 2008, policymakers around the globe might consider funding and maintaining large, high-quality coast guards. It would also be sensible to fund expanded measures to prevent jihadists from embarking on attack operations from certain high-threat ports, such as Karachi, Aden, and Mogadishu.[4]

SPONSOR: U.S. Naval Special Warfare Command

PROJECT LEADERS: Dick Hoffmann and Paul DeLuca

3 *Victory Has a Thousand Fathers: Sources of Success in Counterinsurgency*, Christopher Paul, Colin P. Clarke, and Beth Grill, MG-964-OSD, 2010. Online at www.rand.org/pubs/monographs/MG964.html

Summarized in *Annual Report 2010–2011*, RAND National Security Research Division, AR-7162-OSD, pp. 16–18. Online at www.rand.org/pubs/annual_reports/AR7162.html

4 For more information, see *Characterizing and Exploring the Implications of Maritime Irregular Warfare*, Molly Dunigan, Dick Hoffmann, Peter Chalk, Brian Nichiporuk, and Paul DeLuca, MG-1127-NAVY, 2012. Online at www.rand.org/pubs/monographs/MG1127.html

Israel and Iran: Can the United States Lower the Heat?

- Growing hostility between Israel and Iran over the past decade has reached a crisis point due to concerns over Iran's nuclear progress and the Israeli view that Iran is seeking to develop nuclear weapons.
- A RAND study examined the history and circumstances leading up to the current situation to identify a course of action aimed at preventing military conflict.
- Strengthening U.S. ties with Israel, encouraging communication between Israel and Iran through unofficial channels, and focusing U.S. attention on other concerns related to Iran, such as human rights issues, may help ease tensions.

If allowed to escalate, the rivalry between Israel and Iran could result in a military conflict with disastrous implications.

Over the past decade, a confluence of circumstances has turned what was once an unspoken alliance between Israel and Iran into an increasingly bitter rivalry. If allowed to escalate, this rivalry could result in a military conflict with disastrous implications, not only for the region but also for U.S. interests. What caused this reversal, and what steps should the United States take to try to avert a crisis? To address these questions, NDRI researchers interviewed a wide array of current and former government officials, subject-matter experts, and members of the press in Israel, as well as regional experts in Washington and abroad. Their perspectives informed the findings and recommendations of a recent RAND report on the Israel-Iran relationship and the U.S. role in keeping tensions at bay.

Israel and Iran Have Not Always Been Rivals

In the past, Israel and Iran had no geopolitical or economic basis for competition or conflict. With no shared borders and with each country maintaining its own distinct regional zone of interest, they had no territorial disputes.

In fact, shared geopolitical interests between the two nations resulted in cooperation, if not official recognition, during the reign of Iran's last monarch, Mohammad Reza Shah Pahlavi. The Shah regarded an alliance with Israel as a counterweight to the threat posed by Iran's Arab neighbors, as well as Soviet influence in the region, and regarded Israel's close ties with the United States as having a potential benefit for Iran.

Even after the fall of the Shah during the 1979 Iranian revolution, cooperation continued. Several of Iran's post-revolutionary leaders, particularly presidents Hashemi Rafsanjani and Mohammad Khatami, placed a high priority on reforming Iran's economic, social, and political systems, which would have eased tensions with the United States and, potentially, Israel. At the same time, both Israel and Iran viewed Saddam Hussein and Iraq as the greatest obstacles to their respective national security interests. This spirit of tacit cooperation weakened by the 1990s, but neither country yet viewed the other as its primary regional adversary.

Israel's Fears of Iran Are Both Strategic and Ideological

Over the past decade, Israel has come to view nearly every regional threat as emanating in some way from Iran. Iran openly armed Hezbollah ("Party of God"), the Lebanon-based Shi'a Muslim militant group and political party, throughout the group's 2006 war with Israel. Iran's political and economic support for Hamas

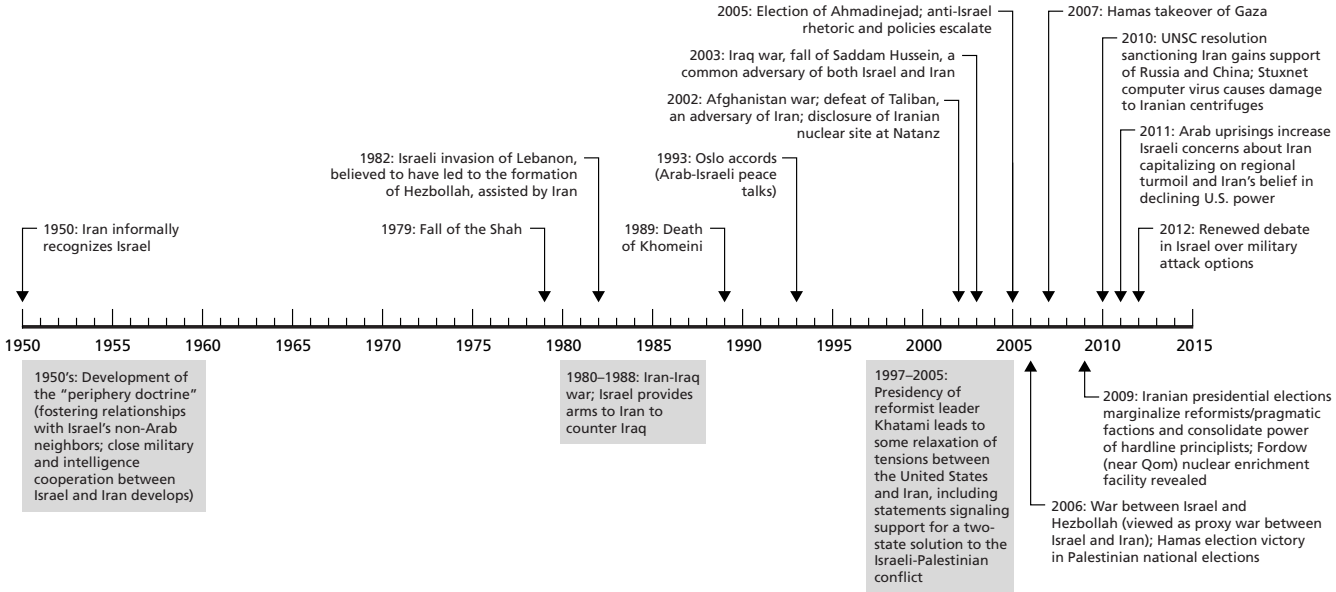
("Islamic Resistance Movement"), the main Islamist movement among the Palestinians, puts Iran at Israel's doorstep in Gaza in Israeli strategic thinking.

Another factor driving Israel and Iran apart was the U.S. invasion of Iraq in 2003 and the defeat of Saddam Hussein. With the weakening of Iraq, Iran began to view itself as the rising power in the Middle East, a view shared by many Israeli political and military experts and strengthened by Iran's effective tactical and strategic support of Hezbollah in its war with Israel.

Adding to Israel's concerns has been Iran's increasing ideological hostility toward Israel. This stance and the resulting rhetoric can be traced, at least in part, to the rise of the Revolutionary Guards—a branch of the Iranian military charged with safeguarding the Islamic Republic—and the increasing power of the principlists, or fundamentalists, following the 2005 election of President Mahmoud Ahmadinejad.

Possibly the most serious development fueling Israel's concerns is the expansion of Iran's nuclear capabilities and long-range missile systems. Israeli officials and analysts believe that, if Iran were to develop nuclear weapons, its potential influence in the Middle East would continue to grow. Some Israeli leaders also believe that a stable deterrence relationship between a nuclear-armed Iran and Israel would not be possible. However, despite widespread agreement within Israel's strategic community about the threat posed by Iran, a growing disagreement has emerged about how to address it. In particular, officials and analysts are divided about the likely costs and benefits if Israel were to launch a military strike against Iran. Israeli views on the potential effectiveness of sanctions and sabotage efforts—along with the U.S. position—could influence these internal debates.

Over the past decade, Israeli-Iranian relations have been characterized by growing hostility, but this was not always the case.



International Security and Defense Policy Center

Iran's Fears of Israel Stem from Its Ties with the United States

In addition to Iran's deep-seated ideological hostility toward Israel and belief that this hostility gives it a geopolitical advantage with respect to its Arab neighbors, Iran's views of and behavior toward Israel have been shaped by one more key factor: Iran's perception of the United States as its primary adversary and a belief that Israel and the United States are fully aligned in their interests. The Iranian regime believes that both Israel and the United States are determined to undermine the current government by directly and indirectly aiding opposition groups and fomenting internal instability.

The United States Can Help Israel and Iran Avoid Military Conflict

The United States can help manage the rivalry between Israel and Iran by continuing policies focusing on both prevention and preparation. Specifically, it can pursue several strategies simultaneously:

- Avoid publicly pressuring Israel, which would turn popular opinion against the United States.
- Quietly attempt to influence internal Israeli debates about the utility of a military strike.
- Continue to strengthen security cooperation and intelligence-sharing with Israel, and do so in a way that is transparent to the Israeli people.
- Continue activities, such as war games that have been organized through nongovernmental institutions in the United States and Israel, that are aimed at fostering a deterrence relationship between Israel and Iran.
- Encourage direct communication between Israelis and Iranians through unofficial channels.
- Continue both engagement and sanction policies that might influence Iran's internal debate on nuclear weapon development.

Finally, given the critical internal weaknesses in the current Iranian regime, the United States needs to pay close attention not only to developments in Iran's nuclear program but also to other issues of concern in Iran, such as human rights abuses. Broadening the focus in this way would signal to Iran that the United States views it as a nation and not simply as a problem to be solved.

Dalia Dassa Kaye and Alireza Nader
Project Leaders

For more information, see *Israel and Iran: A Dangerous Rivalry*, Dalia Dassa Kaye, Alireza Nader, and Parisa Roshan, MG-1143-OSD, 2011. Online at www.rand.org/pubs/monographs/MG1143.html

Afghan Peace Talks: A Primer

- The concept of peace negotiations in Afghanistan has been embraced by the Afghan and U.S. governments, NATO, and many of Afghanistan's neighbors.
- Most parties share at least one common objective: a stable and peaceful Afghanistan that neither hosts nor collaborates with international terrorists.
- Arriving at an agreement about all the pertinent issues will be difficult.
- Recommendations include appointing a United Nations–endorsed facilitator, offering to include former insurgents in a coalition government, and a U.S. promise to withdraw combat forces on a schedule aligned with the implementation of other aspects of an accord.

In 2010, James Dobbins, a RAND Corporation senior fellow and former special envoy to Afghanistan, began to participate in exploratory discussions (under the auspices of the Century Foundation) regarding the possibility of a negotiated peace in Afghanistan. At that time, the concept of talking to the enemy was controversial in official circles and little discussed beyond them. Today, U.S. envoys have begun talking to the Taliban, and peace negotiations are a real, if by no means certain, prospect.

Based on personal experience with Afghanistan and conversations with many participants in the Afghan peace process, with support from RAND's program of self-initiated independent research, Dobbins and former Assistant Secretary of Defense James Shinn produced a RAND monograph to record their observations about the peace process and provide a guide for officials in the conduct of negotiations.

The Principal Parties All Have an Interest in Negotiations

The United States would like to prevent Afghanistan from becoming a haven for, or ally to, terrorists. That objective might be achieved through an indefinite commitment of resources to a counterinsurgency effort. Alternatively, the Taliban might be persuaded to cut ties with al Qaeda and end its insurgency in exchange for some role in Afghan governance. If that objective could be achieved through negotiations, the United States could benefit. The Kabul regime is fighting for representative government (as well as its own survival), and it is prepared to accept participation by the insurgents in government if they lay down their arms. Opinion polling shows overwhelming support within Afghan society for a negotiated settlement and a willingness to bring the Taliban back into the fold in something short of a dominant position. Finally, interviews conducted with Taliban representatives and those close to them suggest serious interest in a negotiated settlement. (The demise of Osama bin Laden may be contributing to anxiety among Taliban leaders about their own security.)

Among the Negotiators, Some Priorities Overlap

There is considerable overlap in the priorities of the negotiating parties to any Afghan peace accord, as illustrated in the table. The United States and other foreign governments want assurances that Afghan territory will not be used to their disadvantage,

The Kabul regime is fighting for representative government and is prepared to accept participation by insurgents if they lay down their arms.

whether by third parties or the Afghans themselves. Afghans, for their part, want foreigners to stop interfering in their affairs. Nearly everyone, including the publics in Western countries, wants the withdrawal of Western armed forces. There is less agreement on other issues: for example, the timing of the withdrawal of NATO forces, the imposition of sharia law, and the manner in which the Taliban leadership will be allowed to share in the county's governance.

Negotiations Require an Independent Facilitator

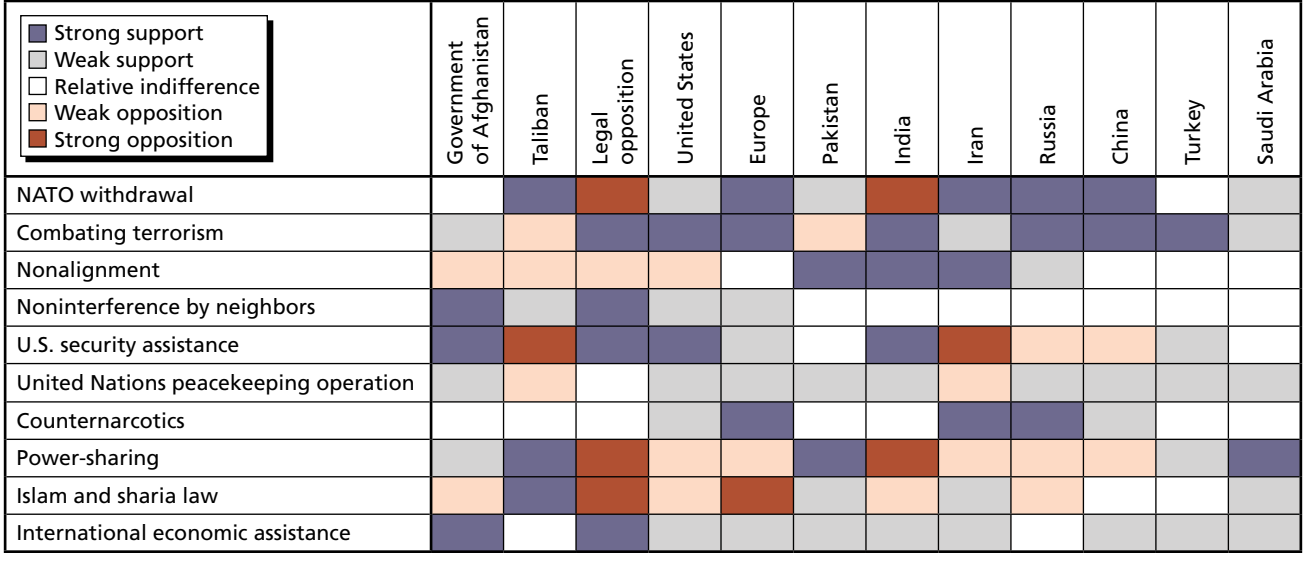
One of the main obstacles to a negotiated settlement will be getting the respective parties, many of whom are internally divided, to decide what they really want and what they are willing to trade for it. Herding such cats will require diplomatic skill. The United States will be by far the most influential participant but, as one of the main protagonists, is not in the best position to mediate. A United Nations–endorsed figure of international repute with the requisite impartiality, knowledge, contacts, and diplomatic skills should orchestrate a multitiered negotiation process with the Afghans at its core. Doha, Qatar, is a likely locale, especially if the Taliban objects to a NATO locale, such as Germany or Turkey.

Both Insurgents and Government Forces Will Have to Be Demobilized

There are between 25,000 and 35,000 insurgents, some of whom will have to be integrated into the government forces. But there are more than 250,000 Afghan Army and police personnel, a number far in excess of what the country will be able to afford or that donors will fund once the fighting ceases. Their demobilization is likely to be even more demanding and certainly more expensive than the demobilization of the insurgents. It will be important that those being marshaled out receive generous severance packages and some prospect of subsequent employment. Ideally, U.S. forces will not be fully withdrawn until the end of this process.

A summary of priorities in the Afghan peace process shows areas of alignment and disagreement among stakeholders.

Stakeholder Views About Issues Central to the Peace Process



The Taliban Must Break Completely with Al Qaeda

As part of any accord, the United States will insist that the Taliban completely break with al Qaeda and other terrorist groups before a full U.S. departure. The evidence will be both the Taliban's surrender of the non-Afghan terrorist leaders still enjoying its hospitality and its agreement to suitable means of verifying that these leaders are not invited back.

The United States Should Prepare for Two Futures: One Negotiated and One Not

The United States must be prepared to both stay indefinitely and go definitively. If negotiations fail, some level of U.S. military engagement may be necessary well beyond 2014. Indeed, without the prospect of an enduring American presence, the Taliban would have little incentive to negotiate rather than wait the United States out. But the full withdrawal of American troops from the country by some not-so-distant date is probably a necessary component of any peace deal. This uncomfortable paradox accounts for much of the dissent and confusion in the American domestic debate on strategy in Afghanistan.

In bargaining terms, promising to withdraw troops is the U.S. counterpart to the Taliban's commitment to cut its ties with al Qaeda. These potential concessions represent each side's highest cards and are thus likely to be played only at the culmination of a negotiation process.

Implementation Requires Ongoing U.S. Involvement

The implementation of a peace accord will require a level of mutual trust likely to be absent on both sides. Additionally, whenever U.S. and NATO troops do ultimately depart, they will leave behind something of a power vacuum. It will be important, therefore, to identify during the negotiating process some follow-on international military and political presence that can oversee implementation of a peace agreement—a presence that is sufficiently robust to deal with spoilers. The United Nations is the logical candidate to deploy a peacekeeping force to Afghanistan.

It will be important to identify some follow-on international presence that can oversee implementation of a peace agreement.

James Dobbins Project Leader

For more information, see *Afghan Peace Talks: A Primer*, James Shinn and James Dobbins, MG-1131-RC, 2011. Online at www.rand.org/pubs/monographs/MG1131.html

Supporting the Transition from Insurgency to Stability

- Key capabilities for a successful transition between a counterinsurgency campaign and a phase of stability and reconstruction include
  - the successful handoff of economic and security operations from the military to police and civilian organizations
  - the establishment of key intelligence, surveillance, and reconnaissance capabilities and systems
  - the development of police and justice functions
  - an integrated process to disarm, demobilize, and reintegrate ex-combatants into a civilian setting.
- By expanding capabilities in these areas, the United States and its partners can facilitate transitions following counterinsurgency campaigns.

During counterinsurgency (COIN) campaigns, the military takes primary responsibility for security and economic operations, but when the insurgency has been reduced to a level where the state is able to perform its basic functions, police and civilian government agencies take the lead in providing security and services to the population. An NDRI study for the Office of the Secretary of Defense examined how countries confronting insurgencies transition to more stable conditions, focusing on the capabilities needed for success.

The handoff of security operations is one of the most complex transitions that the U.S. military faces.

What Is a COIN Transition?

The researchers defined a *COIN transition* as the period between the COIN campaign, during which the military takes primary responsibility for security and economic operations, and stability and reconstruction, in which the police and civilian government agencies take the lead. The figure depicts the characteristics of a COIN transition.

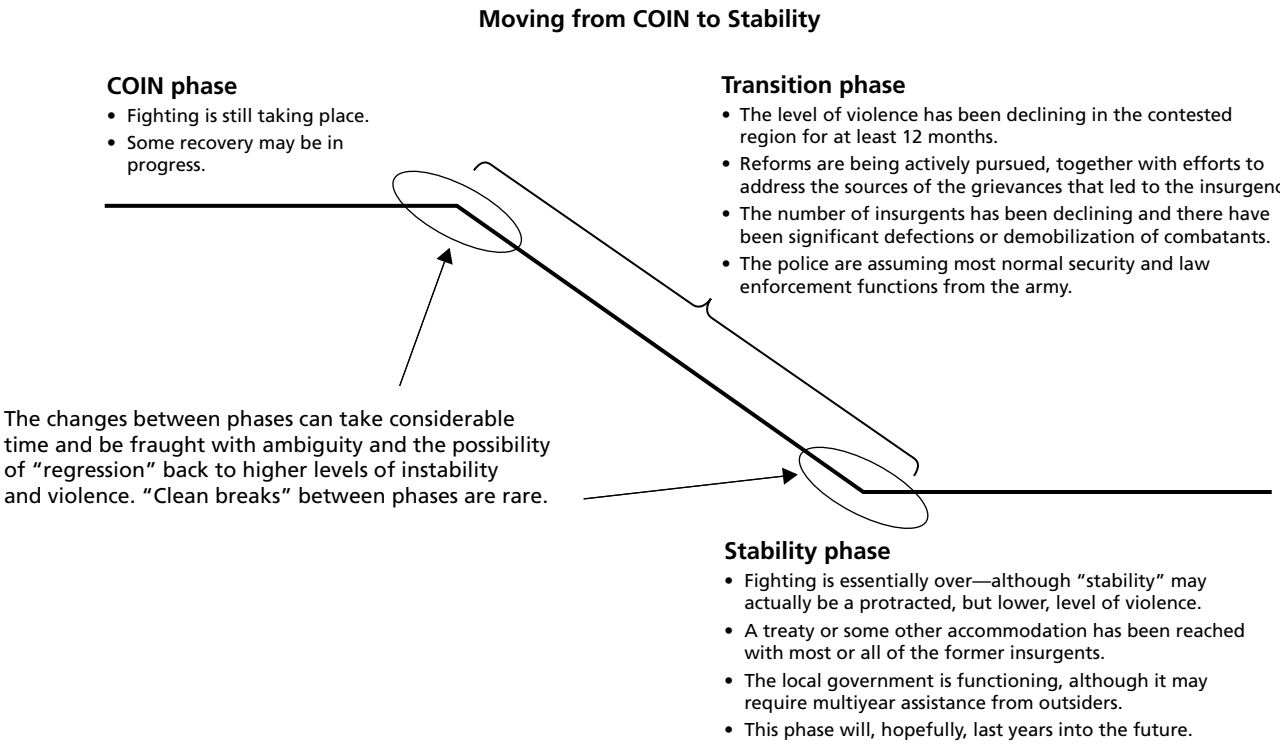
Capabilities Needed for a Successful Transition

The researchers identified several capabilities that are critical for a successful COIN transition and investigated the potential contributions of the United States.

Security operations. The hallmark of a successful transition is the handoff of security operations, including peacekeeping, training and equipping local security forces, reestablishing civil authority, and developing institutional capacity and governance. This handoff is one of the most complex transitions that the U.S. military faces.

Intelligence, surveillance, and reconnaissance (ISR). Certain types of ISR capabilities and information systems are critical. In particular, U.S. planners must carefully consider the types of U.S.-developed infrastructure, equipment, and technology that the host nation or U.S. government civilian agencies will be able to sustain.

Economic operations. The United States needs to develop structures and procedures to coordinate economic operations during COIN transitions. Tools are also needed to assess the overall impact of projects on sustained economic development.



The concept of COIN transition includes a critical transition phase, often characterized by temporary returns to violence but an overall, gradual path to stability.

Contractor support. Civilian agencies typically do not have sufficient capacity to design, implement, and evaluate the level of contract activity that can be associated with large-scale stability and reconstruction operations. U.S. civilian agencies need a unified system to monitor the status of deployed positions.

Disarmament, demobilization, and reintegration (DDR). DDR should be integrated with a comprehensive set of postconflict reconstruction and development projects. All insurgent armed formations should be included in DDR planning.

Police functions. The United States is not ideally equipped to perform police duties abroad. It also lacks the constabulary-type police force that has proven helpful in assisting states during COIN transition.

Justice system. Building a justice system is a long-term initiative that requires encouraging the adoption of processes, principles, and attitudes toward the law and legal institutions. Human-resource needs (judges, prosecutors, lawyers) pose a particular challenge.

International support. Support from international partners will likely be needed, particularly in training constabulary forces and reforming interior ministries.

Conclusions and Recommendations

The study resulted in the following recommendations.

Handoff of Economic and Security Operations

- Planning should be firmly established in advance for the handoff of security and economic operations to the host-nation government's control. Cooperation between U.S. military and civilian agencies is also important.

- The host-nation government and its institutions and supporting organizations need to be integrated into stability and reconstruction planning.
- Processes are needed to ease the handoff of contract management from military to U.S. civilian agency control—and eventually to host-nation agencies.
- Methods are needed to estimate the requirements for building or rebuilding the host nation's police forces.

Disarmament, Demobilization, and Reintegration

- Programs require adequate resources to ensure that they meet their short-term goals and foster the long-term normalization process.
- The appropriate application of information technology in the DDR process can help confirm the identity of insurgents during and after their demobilization.

Police and Justice Functions

- The priority of the police should be to reestablish coverage of all national territory so as to restore order and deny geographical and human terrain to the insurgents. Capacity and sustainability are also priorities.
- Reinforcing police and justice capabilities should be an integrated effort because they build on each other to provide the basic services that the population expects.

International Partners

- Washington has leverage to steer the policy of international organizations and to engage partners among them, which could trigger more support.

In all areas, there needs to be unity of effort between the military and law enforcement agencies, as well as adequate intelligence coordination. Where there is international involvement, participating countries need adequate information for a threat and needs assessment to inform the mission's mandate and training. Technological solutions, including nonlethal technologies, identification systems, and secure communications, are also important.

John Gordon IV and Angel Rabasa
Project Leaders

For more information, see *From Insurgency to Stability, Volume I: Key Capabilities and Practices*, Angel Rabasa, John Gordon IV, Peter Chalk, Christopher S. Chivvis, Audra K. Grant, K. Scott McMahon, Laurel E. Miller, Marco Overhaus, and Stephanie Pezard, MG-1111/1-OSD, 2011. Online at www.rand.org/pubs/monographs/MG1111z1.html

From Insurgency to Stability, Volume II: Insights from Selected Case Studies, Angel Rabasa, John Gordon IV, Peter Chalk, Audra K. Grant, K. Scott McMahon, Stephanie Pezard, Caroline Reilly, David Ucko, and S. Rebecca Zimmerman, MG-1111/2-OSD, 2011. Online at www.rand.org/pubs/monographs/MG1111z2.html

Acquisition and Technology Policy Center

Cynthia R. Cook, Director
Acquisition and Technology Policy Center

The U.S. Department of Defense operates in a world of proliferating advanced technologies, technically competent regional military powers, declining budgets for developing and acquiring new platforms, and increasing platform costs. NSRD's Acquisition and Technology Policy Center assists DoD and allied national security partners in maintaining a reliable and affordable technological advantage over a diverse array of threats. To that end, the center conducts research on new technologies and systems, including the careful examination of cost-benefit trade-offs, and fosters understanding of the underlying fiscal and management challenges.

New technologies offer exciting new capabilities, but that does not easily translate into effective systems—or successfully integrated systems. Ensuring overall system effectiveness requires an assessment of both the technologies and potential employment options. What new technologies should the military invest in? Comparing the advantages and costs of the various alternatives to ensure the best outcome is a standing analytic challenge.

These new capabilities come, for the most part, from the U.S. defense industrial base, but this asset faces a decrease in funding. There has already been significant consolidation among contractors. Given this reality, the military must target its investments carefully to ensure that capabilities are available, that cuts can be reversed, and that defense production can surge if necessary.

Along with these issues, the U.S. military faces a core set of challenges that are inherent in a complex acquisition system with numerous stakeholders, many with competing interests. The continual assessment of new acquisition and management strategies, processes, and organizational structures can improve system efficiency, limit the extent of cost overruns, and increase the likelihood that effective systems are delivered to the warfighter.

Acquisition and Technology Policy Center

SOME RECENT AND ONGOING PROJECTS

Keeping a Competitive U.S. Military Aircraft Industry Aloft

For at least two decades, policymakers have expressed concerns over the trend toward consolidation among prime contractors involved in designing and producing U.S. military aircraft. The fear has been that erosion of the competitive environment will sap the industry's ability to innovate. In 2001, at the request of the U.S. Senate, DoD asked NDRI to study the risk and cost implications of having no competition in the military fixed-wing aircraft industrial base. In 2009, the House Armed Services Committee asked for an update of that study.

The NDRI research team adhered closely to the congressional focus on ensuring that at least two firms could design, produce, and support military aircraft in the future. While aircraft procurement funding is currently split fairly evenly between two primes, a single firm is drawing most of the funding for research, development, testing, and evaluation (RDT&E). Therefore, the researchers looked to the ability of new programs to support competing firms, not only in the immediate future but over the next 15 years. Relatively small design programs, such as for a trainer, tanker, or unmanned aerial vehicle (or all of those together), could not remedy the current lack of a diverse RDT&E base or sustain a competitive procurement sector beyond 2015. It would take a large program—a next-generation bomber, for example—to sustain two firms with RDT&E funding through 2020 and with procurement funding through 2025 and beyond. While additional major programs might sustain two firms (or possibly even three) over that period, the firms that most need the work at any given time may not win competitions for it. Directed shares may be required to keep more than one company going.[5]

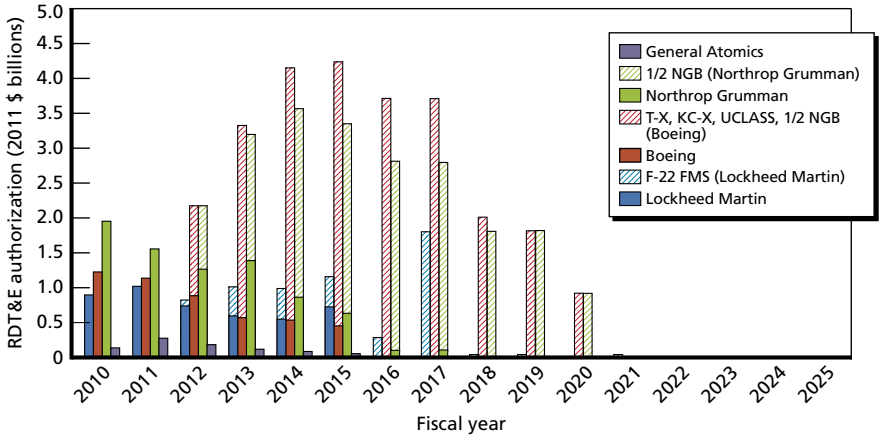
SPONSOR: Office of the Secretary of Defense

PROJECT LEADER: John Birkler

Defending Against the New Generation of Computer Worms

Iran's announcement that a computer worm called Stuxnet had infected computers that controlled one of its nuclear processing facilities marked a signal event in cyber attacks. It proved that worms pose a serious threat to industrial systems. The creators were able to implant the worm on computers that were almost certainly not connected to the Internet, and they were apparently able to mask its presence even while it was modifying the signals that the industrial control systems were sending. Reportedly, the worm damaged hundreds of gas centrifuges. Industrial control systems are ubiquitous; they control electrical power, gas, refineries, and many other systems. The ability to tamper with them and cause physical damage is worrisome.

NDRI published a paper exploring the implications of computer worms for the United States and for DoD in particular. The authors concluded that cyberspace favors the attacker, who can be anonymous, of unknown provenance, and ephemeral. It is essentially impossible to thwart all attacks, so the emphasis must be on response. However, response is difficult when it is not always obvious that an attack has occurred. A worm may be planted long before it is activated, and it may erase itself before the true extent of the damage has been recognized. Furthermore, bureaucratic and legal issues can hamper defense, which must be coordinated across various federal agencies and possibly the private sector as well. The authors recommend congressional action in pursuit of two objectives: enabling better



The next-generation bomber would sustain two prime contractors.

NOTE: NGB = next-generation bomber; T-X = new trainer; KC-X = new tanker; UCLASS = unmanned carrier-launched surveillance and strike aircraft; FMS = foreign military sales.

cross-agency and public-private coordination and granting at least one capable organization the authority to track cyber intruders and criminals with the same freedom of maneuver that these adversaries enjoy.[6]

SPONSOR: Office of the Secretary of Defense
PROJECT LEADER: Isaac R. Porche III

Assessment of DoD Biometrics

The Principal Staff Assistant for DoD Biometrics is required to assess at least annually the assignments and arrangements made by the Executive Assistant for DoD Biometrics. The central assessment criterion is whether the assignments and arrangements meet continuing requirements for effectiveness and efficiency from the user's viewpoint. An annual report to the Secretary of Defense on the overall status of DoD biometrics is also required. Biometric support to the warfighter has been funded for several years under the rubric of quick-reaction capabilities—predominantly with resources for overseas contingency operations (OCO) provided for Iraq and Afghanistan—but the enduring portions of these capabilities have not been developed into programs of record. This has led to the deployment of multiple technologies that are not fully interoperable and inhibit critical information-sharing. Moreover, OCO funds and DoD's base budgets are decreasing, requiring difficult decisions about what level of biometrics capability to maintain in the future. Consequently, DoD must seek ways to improve efficiency while still meeting current and future biometric requirements, some of which may encompass increased support to law enforcement and other mission sets.

NDRI has been asked to conduct the required assessment and to provide a status report that includes options and recommendations for DoD to improve defense biometric capabilities across technology, policy, and human factors. Specific elements considered include actors and stakeholders at the strategic and operational levels; necessary steps in collecting, storing, and using biometric data; mission areas in intelligence, warfighting, and other military operations; joint and interagency interoperability and information-sharing needs; the architecture of DoD biometrics information systems; applications in screening and access control; and metrics for the efficiency and effectiveness of technology development, procurement, and deployment efforts.

SPONSOR: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
PROJECT LEADER: Douglas Shontz

A soldier photographs an Afghan traveler at a checkpoint in the Shah Wali Kot district of Afghanistan. The photo of the man's iris will be entered into a biometrics identification system.

Lessons from Experience in Designing and Building Submarines

Designing and building naval submarines are complex tasks that require organizations with unique skills and expertise. Technical personnel, designers, workers in the construction trades, and program managers gain knowledge and experience by working on successive programs during their careers. This will be more difficult in the future as the long operational lives of submarines and the constrained defense budgets of most countries will likely create gaps between new submarine design and build programs. Recognizing the importance of past experiences for successful program management, top submarine acquisition managers from the United States, the United Kingdom, and Australia asked RAND to derive a set of lessons learned from previous submarine programs that could help inform future program managers.

The research team drew 30 lessons in several categories. Among top-level strategic lessons, the team suggested establishing the roles and responsibilities of the government and private-sector organizations; taking a long-term, strategic view of the submarine force and the industrial base; and adequately supporting any new program and making it open and transparent to all. Lessons for setting operational requirements included involving all appropriate organizations and clearly stating requirements as a set of performance goals. Other lessons addressed acquisition and contracting: considering a single design/build contract

for the first of a class and developing realistic cost and schedule estimates, among others. The team also drew lessons for designing and building the submarine (e.g., completing most design drawings before the start of construction) and for establishing an integrated logistics support plan.[7]

SPONSOR: U.S. Navy

PROJECT LEADER: John F. Schank

U.S. attack submarine SSN 782 (Mississippi) under construction in April 2011 by General Dynamics Electric Boat at Groton Shipyard, Connecticut.

5 For more information, see *Keeping a Competitive U.S. Military Aircraft Industry Aloft: Findings from an Analysis of the Industrial Base*, John Birkler, Paul Bracken, Gordon T. Lee, Mark A. Lorell, Soumen Saha, and Shane Tierney, MG-1133-OSD, 2011. Online at www.rand.org/pubs/monographs/MG1133.html

6 For further information, see *A Cyberworm That Knows No Boundaries*, Isaac R. Porche III, Jerry M. Sollinger, and Shawn McKay, OP-342-OSD, 2011. Online at www.rand.org/pubs/occasional_papers/OP342.html

7 For more information, see *Learning from Experience, Volume I: Lessons from the Submarine Programs of the United States, United Kingdom, and Australia*, MG-1128/1-NAVY, John F. Schank, Frank W. Lacroix, Robert E. Murphy, Mark V. Arena, and Gordon T. Lee, 2011. Online at www.rand.org/pubs/monographs/MG1128z1.html

Root Cause Analysis of Nunn-McCurdy Breaches

- For each of four major defense acquisition programs examined, excess costs associated with Nunn-McCurdy breaches were linked to three contributing factors: planning, changes in the economy, and program management.
- Within those categories, the programs' cost increases had numerous specific root causes. Examples include underestimation of baseline cost; insufficient research, development, testing, and evaluation; increases in component costs; inflation; and inadequate or unstable program funding.
- A number of lessons can be drawn from these analyses that, if acted upon early in a program, can help avoid cost increases.

The spiraling cost of acquiring weapon systems and the U.S. Government Accountability Office's decision to place defense acquisition on the high-risk target list have led Congress to develop ways to better manage DoD acquisition. The Weapon Systems Acquisition Reform Act of 2009 established a number of requirements that affected the operation of the defense acquisition system and the duties of the key officials who support it. Among the requirements was the establishment of a new organization in the Office of the Secretary of Defense with the mandate to conduct and oversee performance assessments of major defense acquisition programs and analyses of the root causes of any Nunn-McCurdy breach by such a program.

There are two types of breaches: significant and critical. A "significant" breach is when the total cost of development and procurement divided by the number of units procured (called the program acquisition unit cost) or the total procurement cost divided by the number of units procured (called the average procurement unit cost) increases 15 percent or more over the current baseline estimate or 30 percent or more over the original baseline estimate. A "critical" breach occurs when either of those unit costs increases 25 percent or more over the current baseline estimate or 50 percent or more over the original baseline estimate. Unless the Secretary of Defense submits specific written certifications to Congress within 60 days of determining that a breach has occurred, the program is terminated.

How RAND Assisted

The director of Performance Assessments and Root Cause Analyses in the Office of the Assistant Secretary of Defense for Acquisition realized that he needed assistance in carrying out root cause analyses within the 60 days that Congress had stipulated; he turned to federally funded research and development centers and academia for help. Along with several other organizations, NDRI was engaged to perform the analyses and provide recommendations. NDRI was assigned sole responsibility for three programs: the Wideband Global Satellite (WGS), the Longbow Apache Helicopter (Apache Block III), and the *Zumwalt*-class destroyer (DDG-1000). The research team shared responsibility for a fourth program, the Joint Strike Fighter (JSF).[8]

The time allowed under the statute from when the breach was announced to the need for certification was very short.

8 Subsequently, NDRI was assigned three additional programs: the Army's Excalibur, the Joint Tactical Radio Ground Mobile System, and the Navy's Enterprise Resource Planning. Other current efforts involve the Network Enterprise Domain, the P-8 Poseidon aircraft, and a series of research and data development efforts.

These efforts were somewhat unusual for RAND. The time allowed under the statute from when the breach was announced to the need for certification was very short. Therefore, analyses had to rely on government material on hand. Analyses were conducted in concert with government offices, often under the direction of DoD officials, who used the results in performing their inherently governmental functions well before the production of even a draft report.

Results of the Analyses

Root Causes. Although NDRI's work on root causes identified several contributory factors, its analyses of the four programs found that three were common across all programs: planning, changes in the economy, and program management. The table summarizes the root cause analyses of the four programs reviewed, listing the causes in each of the three categories. Beige shading indicates a root cause, and red shading indicates a significant root cause. Significance was a subjective assessment by the research team of the overall effect on the program. As the table shows, several root causes applied to all four programs: underestimation of baseline cost; insufficient research, development, testing, and evaluation (RDT&E); increases in component costs; inflation; and inadequate or unstable program funding. The prevalence of

Some root causes of cost growth were common across the programs examined: underestimation of baseline cost, insufficient RDT&E, increases in component costs, inflation, and inadequate or unstable program funding.

Comparison Matrix of Root Causes of Program Cost Growth

Category	Root Cause of Nunn-McCurdy Breach	WGS	Apache	DDG-1000	JSF
Planning	Underestimate of baseline cost	Root cause	Root cause	Root cause	Root cause
	Ambitious scheduling estimates			Root cause	Root cause
	Poorly constructed contractual incentives	Significant root cause			Root cause
	Immature technologies		Significant root cause	Root cause	Significant root cause
	Ill-conceived manufacturing process			Root cause	
	Unrealistic performance expectations			Root cause	
	Delay in awarding contract			Root cause	
	Insufficient RDT&E	Root cause	Root cause	Root cause	Root cause
Changes in Economy	Increase in component costs	Significant root cause	Root cause	Root cause	Root cause
	Increase in labor costs		Root cause		Root cause
	Discontinued/decreased production of components	Root cause			
	Decreased demand for similar technology in private sector (economies of scale)	Root cause			
	Inflation	Root cause	Root cause	Root cause	Root cause
Program Management	Production delays	Significant root cause		Root cause	Significant root cause
	Change in procurement quantities				
	Increase	Root cause	Significant root cause		
	Decrease			Significant root cause	Root cause
	Unanticipated design, manufacturing, and technology integration issues		Significant root cause	Root cause	Significant root cause
	Lack of government oversight and/or poor performance by contractor personnel			Root cause	Root cause
	Inadequate or unstable program funding	Root cause	Root cause	Root cause	Root cause
	Accounting artifact	Root cause			

NOTE: Root cause Significant root cause

these same factors across four very different programs may indicate systemic root causes that warrant increased attention in future program planning.

Lessons Learned. Analysis of the root causes of the Nunn-McCurdy breaches led NDRI researchers to draw the following lessons:

- Production delays increase exposure to changing private-sector market conditions, which can result in cost growth.
- Acquisition flexibility (e.g., start-stop programs) comes with a cost.
- Cost estimates should be conducted independently of a program manager.
- Combining remanufactured and new-build items increases complexity and can lead to cost growth.
- Greater planning of manufacturing process organization is required.
- Large reductions in procurement quantities can significantly increase per-unit cost.
- Sufficient RDT&E is required to ensure that concepts and designs are "producible" in the construction phase.
- Greater government oversight of the contractor is required in a technologically complex project.
- More "hedges" against risky elements of programs are required.
- Additional collaboration is needed on design specifications and discussion of cost-performance trade-offs.

These lessons can help project managers avoid cost increases if they are attended to promptly in the early phases of the program. For example, when a program has obvious technical complexity, the program manager should take steps early on to ensure that the government has made adequate provisions for oversight of the contractor.

These lessons can help avoid cost increases if they are attended to early in the program.

Irv Blickstein and Charles Nemfakos
Project Leaders

For more information, see *Root Cause Analyses of Nunn-McCurdy Breaches, Volume I:* Zumwalt-*Class Destroyer, Joint Strike Fighter, Longbow Apache, and Wideband Global Satellite*, Irv Blickstein, Michael Boito, Jeffrey A. Drezner, James Dryden, Kenneth Horn, James G. Kallimani, Martin C. Libicki, Megan McKernan, Roger C. Molander, Charles Nemfakos, Chad J. R. Ohlandt, Caroline Reilly, Rena Rudavsky, Jerry M. Sollinger, Katharine Watkins Webb, and Carolyn Wong, MG-1171/1-OSD, 2011. Online at www.rand.org/pubs/monographs/MG1171z1.html

Can Australia Design Its Own Submarines?

- Creating and overseeing the design of a new, conventionally powered submarine for the Royal Australian Navy would take around 1,000 skilled draftsmen and engineers in industry and government working 8–12 million labor-hours over 15 years.
- Using less experienced personnel would increase costs and lengthen the schedule.
- Australia has fewer than 500 submarine-experienced draftsmen and engineers, many of whom are supporting the currently operational *Collins* class.
- A larger workforce could be grown over time starting with a core group of *Collins*-class personnel.

Acquiring the new submarines will be the largest and most complex defense procurement in Australia's history.

In the mid-2020s, the Royal Australian Navy will retire HMAS *Collins*, the oldest of Australia's *Collins*-class submarines, when it reaches the end of its 30-year service life. Over the course of the following decade, the other five submarines that constitute the *Collins* class could also face retirement when their respective service lives end.

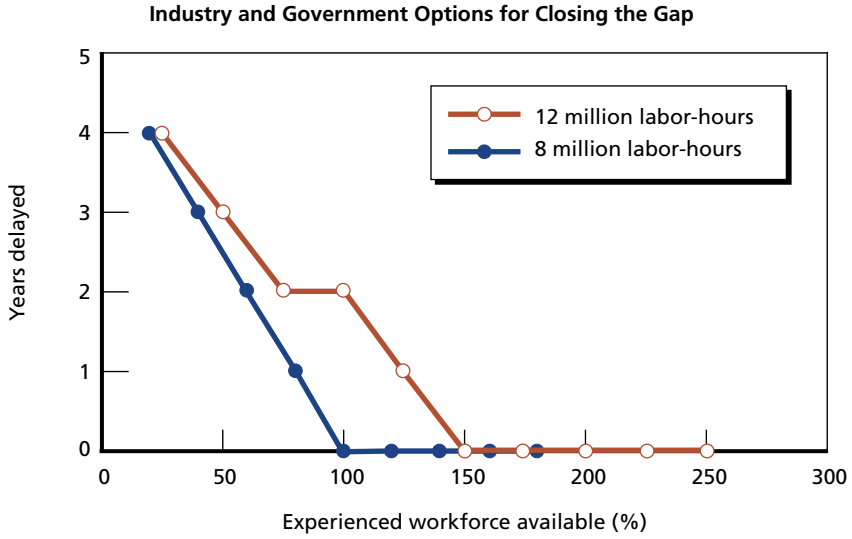
Australia intends to acquire 12 new submarines to replace the *Collins*-class vessels. The replacement submarine—known as the Future Submarine—will be designed to travel farther, stay on patrol longer, support more missions, and provide more capabilities than the *Collins* vessels.

Acquiring these new submarines will be the largest and most complex defense procurement in Australia's history. Nonetheless, the Australian government is considering having the vessels designed domestically and built in South Australia. Because Australia has never designed a submarine, the Australian Department of Defence sought outside help to assess the domestic design skills that the country's industry and government will need. A RAND study sought to address the following questions: How do the required skills compare with current Australian capabilities? How might any gaps be filled?

The RAND research team included a former CEO of the Australian Defence Science and Technology Organisation, as well as former officials from U.S. submarine acquisition commands and personnel with submarine technical and operational experience. The team reviewed the current literature on submarine design and engineering, analyzed historical design workload data from the United Kingdom's *Upholder* program and the *Collins* program, and surveyed industry and government representatives on current and expected design practices.

Australia's Submarine Design Skills Gap

The team concluded that designing a conventional submarine today would require an effort of 8–12 million labor-hours over 15 years from a workforce of fully proficient, experienced submarine design personnel. This translates to a labor pool that, at its peak, would involve 600–900 submarine-proficient draftsmen and engineers in industry, plus 80–175 oversight personnel in government.



In a 15-year design effort, if (as is expected) fewer than 50 percent of submarine-experienced engineers are available, schedule delays will result.

The team found that while government employs enough oversight personnel to meet its peak demand in most skill areas (although the availability of some may be in question), such is not the case for Australian industry. Companies in Australia today do not employ as many experienced submarine draftsmen and engineers with the required skills as would be necessary to meet expected peak program demand at 8–12 million labor-hours.

How would the program fare if Australia were to draw solely from this current industry pool of domestic draftsmen and engineers to design the Future Submarine? That pool totals 475 draftsmen and engineers, many of whom may be engaged in supporting the *Collins* class or other naval programs and thus unavailable for a new submarine design team. It is entirely possible that as few as 20 percent of today's workforce might be available to work on the new submarine.

To explore this issue, the RAND research team constructed a simulation model to gauge how different numbers of draftsmen and engineers with various levels of proficiency would affect the outcome of a 15-year design effort involving 8 million labor-hours. The figure shows the schedule impact as a function of the number of submarine-experienced engineers available to support the new submarine design program. If 20 percent of the submarine-experienced engineers in Australia were available, the schedule would increase by approximately four years. That increase would drop to three years if 40 percent of the skilled workforce were available. If all 275 submarine-experienced engineers were available, there would be no schedule delay at the 8 million labor-hour demand level; an additional 135 submarine-experienced engineers would be needed if the total demand were 12 million labor-hours.

Industry and Government Options for Closing the Gap

The research team's simulations suggest that Australia can avoid cost and schedule delays only by augmenting its current design workforce with 250–500 submarine-experienced personnel. The RAND team evaluated two basic options that industry could pursue to cultivate such submarine design expertise and an array of options that the Australian government could adopt to close gaps in its engineering work-

force. The team's analysis pointed out pros and cons in the options for industry and identified one option that offers the most promise.

Industry option 1: Hire and train personnel from within Australia. This approach would require recruiting and training draftsmen and engineers with no submarine experience. Not only would this workforce need more labor hours and a longer schedule to design the new submarine, it would also need to shrink as the design program neared completion. However, the result would be a capability to design submarines solely within Australia.

Industry option 2: Recruit submarine-experienced personnel from abroad. Adding submarine-experienced personnel from abroad to the design workforce—by recruiting internationally, encouraging Australia-based companies to draw from their international offices, or partnering with another country's design organization—would shorten the schedule and lessen the cost increase. The advantage of this approach is that, as the new design program winds down, international personnel could return to their home countries. There is a disadvantage, however: New submarine design programs in the United States and the United Kingdom may preclude the availability of experienced submarine design personnel from those countries, and Australia may not be able to acquire the total capability needed to design a new submarine.

Preferred government option: Draw core personnel from the *Collins* class to start the Future Submarine program, then hire and train new personnel. This option would involve drawing a core group of technical personnel from the workforce currently supporting the *Collins* class and other maritime programs and hiring additional personnel, both as replacements for that core group and as a way to fill out the Future Submarine program. This option would draw from the *Collins*-class experience, reduce the risk of under-resourcing the *Collins* class and other programs, and likely incur reasonable training costs.

John Birkler Project Leader

For more information, see *Australia's Submarine Design Capabilities and Capacities: Challenges and Options for the Future Submarine*, John Birkler, John F. Schank, Jessie Riposo, Mark V. Arena, Robert W. Button, Paul DeLuca, James Dullea, James G. Kallimani, John Leadmon, Gordon T. Lee, Brian McInnis, Robert Murphy, Joel B. Predd, and Raymond H. Williams, MG-1033-AUS, 2011. Online at www.rand.org/pubs/monographs/MG1033.html

Are Ship Programs Different from Other Acquisition Programs?

- Because of lengthy design and production schedules, low production rates, high unit costs, and other factors, ship acquisition programs do not fully fit into the conventional acquisition protocol embodied in DoD's "5000-series" guidance that applies to all defense acquisition programs.
- Tailoring the protocol is permitted but can be difficult, and ambiguities in language can make application of the 5000 series challenging for ships.
- Two remedial steps to consider are clarifying the most critical ambiguities in the 5000 series and standardizing the process for tailoring various aspects of the protocol to accommodate ship acquisition.

From concept to production, managing the construction of a U.S. Navy ship is a complex venture. DoD has a well-established process for the acquisition of weapon systems, but designing, building, and testing Navy ships may stress some aspects of the process. In fact, ship acquisition personnel in both the Navy and the Office of the Secretary of Defense have expressed frustration: While the process is intended to be flexible, adjusting it to accommodate shipbuilding programs is challenging. That the same issues are addressed repeatedly and across different ship programs has led the ship acquisition community to wonder: Are ships different enough from other weapon systems to warrant deep changes in the conventional acquisition process?

In response to this question, an NDRI project team identified aspects of major ship programs that deviate substantially from the generic DoD management process. They also identified ambiguities in the process that affect ship programs. The researchers then suggested changes in DoD and Navy polices to resolve procedural uncertainty for major ship acquisitions.

While the acquisition process is intended to be flexible, adjusting it to accommodate shipbuilding programs is challenging.

Ship Design and Build Milestones Occur at Different Points of the Acquisition Process

The DoD acquisition process is fully described in a set of documents known as the "5000 series," which has been the foundation of the defense acquisition process for more than 50 years. These instructions revolve around three milestones and associated life-cycle phases for weapon system programs (see the first row of boxes in the figure):

- Milestone A is a decision point associated with the technology development phase. Acquisition experts conduct an analysis of alternatives (AoA) to find a solution that will best meet an operational need and propose a specific solution based on the outcome. Full funding for the next phase must be in place.
- Milestone B typically marks the formal initiation of a weapon system program and its entry into the engineering and manufacturing development phase. By this milestone, the program has had a preliminary design review, demonstrated relevant technologies and manufacturing processes, and determined its cost and schedule baselines.
- Milestone C usually denotes the system's entry into the production phase and authorizes that production begin at a low rate. By this milestone, engineering and manufacturing development is complete, and required testing and operational assessments have been successful.

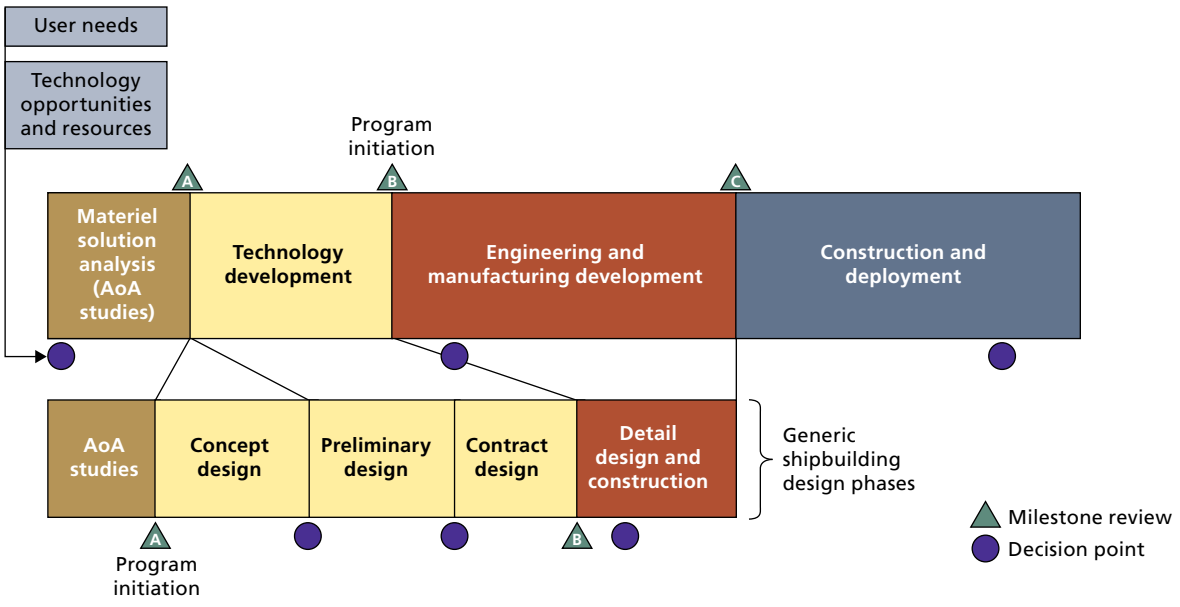
The second row of boxes in the figure shows the points where the Navy's ship acquisition process does not fall in line with the nominal process described in DoD policy. First, shipbuilding programs often begin their formal activities earlier than other weapon system programs. For example, in the technology development phase of Milestone A, nonship programs typically work to reduce technology risk through development activities. System development and program activities, such as procurement and engineering design, wait until the next phase. However, in shipbuilding, the majority of the early design work occurs during the technology development phase. Similarly, detail design and construction activities occur earlier in shipbuilding (during the engineering and manufacturing development phase) than recommended by the DoD process. This often occurs because of differences in the contracting strategies that are appropriate for ships.

Notably, while Milestone A and Milestone B do not always correspond with the traditional model, Milestone C has no corresponding equivalent in the shipbuilding timeline. Production is functionally approved at Milestone B for the lead ship; there are no purely developmental models during engineering and manufacturing development, and the lead ship will become operational. Because production quantities are typically much lower than for other weapon systems, the distinction between low-rate and full-rate production is blurred.

Stakeholders Suggest That Ship Complexity and Ambiguous Directives Create Acquisition Problems

More than two dozen interviews with representatives from the Navy and the Office of the Secretary of Defense confirmed the ways in which shipbuilding programs are different from other major defense acquisition programs and highlighted the unique issues and problems that can arise when following the 5000-series guidance. The interviewees confirmed the differences between the acquisition of ships and that of most weapon systems, as described above. They also discussed several other characteristics that make ships unique: low quantity and low production rate, high unit costs, and distinctive testing and evaluation procedures.

At several critical points, the Navy's ship acquisition process does not align with the acquisition process outlined in DoD's 5000-series guidance for weapon system acquisition.



Many interviewees suggested that ambiguous language in the 5000 series makes the implementation of its processes difficult for ships. Several spoke of the need for revisions to the current documentation to specifically accommodate shipbuilding programs or make it easier to tailor the process to individual programs. Notably, most interviewees did not think that the 5000-series process was irreparable.

Policy Implications

Ship programs are subject to the same broad trends affecting other major defense acquisition programs, including rapid technology change, increasing system complexity, unit and program cost increases, fewer new program starts, and industrial base concerns. Nevertheless, ship programs differ from other programs in terms of their size and complexity, the time it takes to design and build a single unit, the high unit cost, and the pattern of design, development, and construction activities in each program phase.

These characteristics pose a range of policy options to account for the differences associated with ship acquisition. At one extreme, policymakers may choose to exempt ship programs from the 5000 series altogether. This would effectively shift program oversight to the Navy. Of course, it would also shift many of the same scheduling and planning problems over to the Navy as well, as shipbuilding programs can differ from each other significantly. At another extreme, the DoD guidance might be rewritten to include language for individual weapon system types. Rewriting foundational acquisition regulations could result in separate processes for ships, as well as for satellites, launch vehicles, armored vehicles, aircraft, and other programs. If this path is taken, the result might be a highly complex set of acquisition regulations and processes that add to the burden of program managers and oversight officials.

In the near term, policymakers may wish to consider two actions: clarifying the most critical ambiguities of the existing 5000 series and standardizing the process for tailoring various acquisition procedures and requirements to accommodate the unique aspects of shipbuilding.

Several interviewees spoke of the need for revisions to specifically accommodate shipbuilding programs.

Jeffrey A. Drezner Project Leader

For more information, see *Are Ships Different? Policies and Procedures for the Acquisition of Ship Programs*, Jeffrey A. Drezner, Mark V. Arena, Megan McKernan, Robert Murphy, and Jessie Riposo, MG-991-OSD/NAVY, 2011. Online at www.rand.org/pubs/monographs/MG991.html

Forces and Resources Policy Center

John D. Winkler, Director
Forces and Resources Policy Center

Military operations in Afghanistan—together with those now concluded in Iraq—have been the longest and most demanding test of the all-volunteer force since its inception in 1973. More than 2 million service members have been deployed in these operations. Obtaining the needed personnel for the armed forces requires policies to maximize recruiting and retention, including setting compensation and providing benefits at cost-effective levels. But having enough people is just the first step. DoD must recruit or develop people (active- and reserve-component military and DoD civilians) who have the skills necessary to meet the demands of a variety of defense missions.

At the same time, DoD faces structural challenges. For example, the reserves have been transformed from solely a strategic force to both a strategic and an operational one, while the finer points of achieving jointness are a continuing challenge. DoD must also respond to concerns regarding jobs and health care for returning veterans, including those who are wounded, ill, or injured, and, more generally, the reintegration of deployed service members into their families and communities. For reservists, this includes reintegration into the civilian workforce.

All these issues have been the topic of research by NSRD's Forces and Resources Policy Center, which has been actively involved for almost four decades in helping the United States sustain the all-volunteer force. The extensive body of manpower research done by NSRD has helped DoD understand and respond to the recruiting and retention crises in 1979 and 1999, the transition to a mature volunteer force in the 1980s, the post–Cold War drawdown, and, after 9/11, the global war on terrorism. Much of the earlier research focused on the supply of volunteers, but over the past 20 years, the center's research agenda has become more diverse. Supply-oriented projects continue, but there has been more work on military health policy, the quality of military life, and the management and development of military and civilian personnel, including research directed specifically at reserve-component issues. This varied program of research has helped DoD adapt its organizations, policies, and processes to current and evolving manpower and other resource challenges.

SOME RECENT AND ONGOING PROJECTS

Assessing the Needs of Service Members and Their Families

Since the advent of the all-volunteer force in the 1970s, military personnel support programs have multiplied and continue to do so. A 1988 DoD directive requires such programs to be responsive to the needs of service members and their families. Unfortunately, DoD does not have a systematic way to determine what those needs are. Traditional program evaluation focuses on specific programs rather than the needs of DoD families. This shortfall has been remedied in a new survey design framework developed by NDRI.

The framework puts assessments by service members and their families at the center of the analysis. It connects their perceptions of their greatest problems and needs with available resources and with how well the resources met their needs.

The survey instrument was developed with the assistance of service members, their spouses, service providers, military leadership, and program managers. It was tested on a small scale in two of the armed services to help the research team determine how to maximize participation and to collect new insights regarding the survey's content and respondent burden.

The researchers judged the recruitment of survey participants to be the chief implementation challenge; the team recommended that unit and installation commanders help in promoting participation. Once administered, the survey should give commanders a sense of how civilian services are contributing to family needs and where on-base programs could be modified to be more responsive to those needs.

The framework could easily be applied to other populations, such as veterans and their families, guard and reserve personnel and their families, or wounded service members—or for other purposes entirely, such as an assessment of the operational challenges, needs, and resources of military personnel serving in war zones.[9]

SPONSOR: Office of the Under Secretary of Defense for Personnel and Readiness

PROJECT LEADERS: Bernard D. Rostker and Laura L. Miller

Sgt. 1st Class Cedric Shegog, a staff member of the Fort Hood Resiliency Campus, participates in a discussion during Master Resiliency Training, March 13, 2012.

Promoting Psychological Resilience in the Military

The long and frequent deployments of U.S. armed forces over the past decade have tested the resilience and coping skills of military service members and their families. While most personnel and their families are resilient to stress, many do experience difficulties handling it at some point. In response, DoD has implemented a number of programs to promote psychological resilience among service members. Although the value of resilience programs is widely accepted, there has been little empirical data on the programs' effectiveness or the extent to which they are based on factors scientifically identified as contributing to resilience. To help fill that gap, NDRI identified evidence-informed practices linked to psychological resilience and assessed selected resilience programs to determine whether they incorporated such practices.

The researchers reviewed 270 publications and identified 20 individual and contextual factors associated with resilience. The evidence was strongest for eight: positive thinking, positive affect, positive coping, realism, behavioral control, family support, positive command climate, and a sense of community belonging. In interviews with representatives from a selection of 23 DoD resilience programs, the research team found that these key evidence-informed factors were commonly emphasized. However, only five of the 23 programs had conducted formal assess-

ments of their effectiveness. The NDRI team offered nine recommendations: define resilience, integrate resilience programming into policy and doctrine, strengthen existing programs, standardize resilience measures to enable program comparison, provide military members and their families with guidance about available resilience programs, incorporate evidence-informed resilience factors, engage senior military leaders, adopt a flexible curriculum, and conduct more rigorous program evaluation.[10]

SPONSOR: Office of the Assistant Secretary of Defense for Health Affairs

PROJECT LEADER: Lisa S. Meredith

How Deployments Affect Service Members and Their Families

Over the past decade, the extended wars in Iraq and Afghanistan have affected the lives of approximately 2 million U.S. service members and their families in a variety of ways. Of course, the well-being of troops and the people close to them is a central concern. Not only does it potentially affect military readiness and the ability of the armed forces to carry out their mission, but it is also something to which the nation has committed itself in appreciation of the sacrifices made by military families. However, effective policies to facilitate the well-being of this community require a comprehensive understanding of the myriad issues and consequences that service members and their families may face because of the stress of deployment. Yet, for much of the past decade, such understanding was largely lacking.

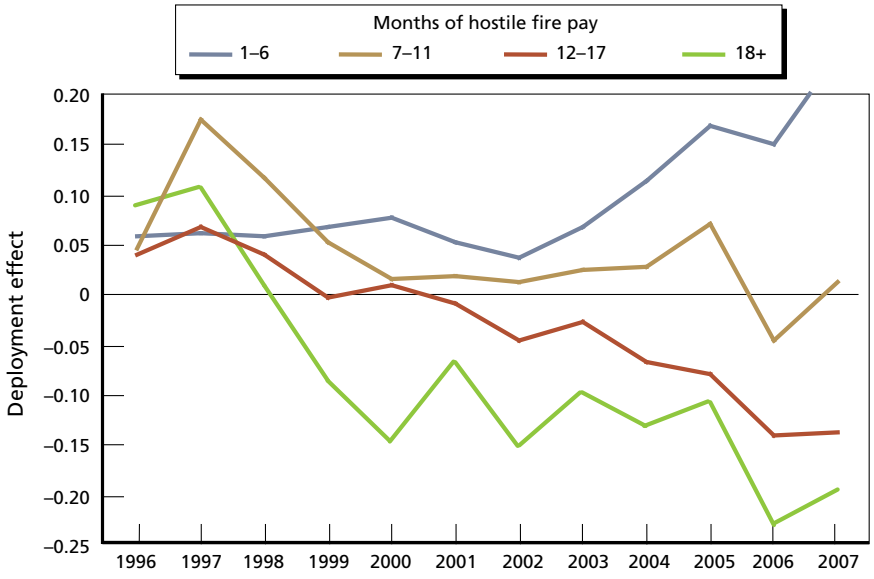
Recognizing the need for analysis, RAND launched a program of research in 2005 to investigate this theme and, where possible, offer policymakers informed recommendations. To ensure widespread attention to these important findings, NSRD recently prepared a paper that offers an overview of six of the earliest RAND studies on various aspects of the theme: how the acute stress of today's military deployments might alter the performance of service members in theater, whether deployment leads to a loss of income by reservists while they are away from their civilian jobs, the extent to which deployed service members are subjected to psychological and cognitive injuries, how activated reservists' families are affected by the experience, whether deployments have negatively affected reenlistment rates in the four services (shown in the figure), and how children react to the absence and return of a deployed parent.[12]

SPONSOR: Office of the Secretary of Defense

PROJECT LEADERS: Various

Implementing DoD's In-Sourcing Policy

For decades, DoD has worked to identify the appropriate balance of contractors and government employees. From the 1970s through the 1990s, the emphasis was on realizing efficiencies through outsourcing. But skepticism grew as cost savings became difficult to track and as questions regarding the appropriate functions of contractors arose. In his fiscal year 2010 budget message, the Secretary of Defense called for growing the civilian workforce by replacing contractors with DoD civilian personnel. A hiring freeze impeded this process in much of DoD, but "in-sourcing" continued in the military departments. The Deputy Secretary of Defense issued a decision tree to



Some deployment time had a positive effect on reenlistments, but by 2006, there was a clear negative effect after seven or more months of deployment.

guide specific choices as to whether to in-source a position or retain it in the private sector, but those needing to make such decisions were nevertheless struggling to interpret and implement the guidance.

To inform these decisions, NDRI researchers assessed current laws and policies pertaining to in-sourcing and developed a framework and methodology for applying them. Implementing the Deputy Secretary's decision tree requires adopting definitions of the criteria and interpreting those definitions. The researchers formulated consistent definitions and developed a questionnaire to assess whether positions meet the criteria. They recommended that departments conduct interviews with civilian leadership and the contractors performing the work before deciding whether to in-source a position. In addition, it was suggested that the in-sourcing analyst spend time observing the work environment, because the nature of the relationship between supervisors and contractors is an important in-sourcing determinant.[11]

SPONSOR: Assistant Deputy Chief of Naval Operations for Integration and Resources

PROJECT LEADERS: Jessie Riposo and Irv Blickstein

Post-Traumatic Stress Disorder and the Earnings of Reservists

Evidence from RAND research suggests a high prevalence of post-traumatic stress disorder (PTSD) among returning active- and reserve-component service members, prompting significant interest in the long-term consequences of PTSD for a variety of health, family, and economic outcomes. An NDRI research team investigated the effects of being symptomatic of PTSD on the employment and earnings of reservists in the years following deployment. Only a handful of studies had directly estimated the effect of PTSD on the labor market outcomes of veterans, and none had included U.S. veterans of the wars in Iraq and Afghanistan. Moreover, although the available studies had controlled for some covariates that are related to both labor market outcomes and PTSD, most lacked data on critical dimensions of health. Thus, it has remained unclear whether the associations they documented represent causal effects of PTSD on labor market outcomes or the confounding effect of omitted factors.

The recent RAND study demonstrated that reservists who are symptomatic of PTSD do in fact earn substantially less—17 percent less in the year after deployment—than other reservists. However, these reservists were earning considerably less than their peers in the year prior to the deployment associated with their trauma. They were also disadvantaged prior to deployment in other respects (e.g., general aptitude, health). When such preexisting differences were controlled for, the analysis showed that reservists who were symptomatic of PTSD earned between 1 and 5 percent less than those who were not symptomatic, depending on the specifics of the statistical method used. These differences tended to increase somewhat with the passage of time, mostly because reservists who were symptomatic of PTSD tended to separate from the military at greater rates than others, and the earnings lost are not offset by gains in the civilian sector.[13]

SPONSOR: Office of the Assistant Secretary of Defense for Reserve Affairs

PROJECT LEADER: David S. Loughran

9 For more information, see *A New Approach for Assessing the Needs of Service Members and Their Families*, Laura L. Miller, Bernard D. Rostker, Rachel M. Burns, Dionne Barnes-Proby, Sandraluz Lara-Cinisomo, and Terry R. West, MG-1124-OSD, 2011. Online at www.rand.org/pubs/monographs/MG1124.html

10 For more information, see *Promoting Psychological Resilience in the U.S. Military,* Lisa S. Meredith, Cathy D. Sherbourne, Sarah J. Gaillot, Lydia Hansell, Hans V. Ritschard, Andrew M. Parker, and Glenda Wrenn, MG-996-OSD, 2011. Online at www.rand.org/pubs/monographs/MG996.html

11 For more information, see *A Methodology for Implementing the Department of Defense's Current In-Sourcing Policy*, Jessie Riposo, Irv Blickstein, Stephanie Young, Geoffrey McGovern, and Brian McInnis, TR-944-NAVY, 2011. Online at www.rand.org/pubs/technical_reports/TR944.html

12 For more information, see *How Is Deployment to Iraq and Afghanistan Affecting U.S. Service Members and Their Families? An Overview of Early RAND Research on the Topic*, James R. Hosek (ed.), OP-316-OSD, 2011. Online at www.rand.org/pubs/occasional_papers/OP316.html

13 For more information, see *Post-Traumatic Stress Disorder and the Earnings of Military Reservists*, David S. Loughran and Paul Heaton, TR-1006-OSD, 2012. Online at www.rand.org/pubs/technical_reports/TR1006.html

Reshaping the Army's Active and Reserve Components

- The Secretary of Defense has issued guidance for maximum deployment time for active-duty service members and maximum mobilization time for reservists (relative to time spent at home or demobilized).
- Some active-duty Army service members and some Army reservists are exceeding the guidance for time spent deployed or mobilized.
- Deployment-to-dwell and activation-to-dwell ratios vary across components and occupations.
- It may be possible to move billets from a low-utilization career field in one component to a high-utilization career field in another.
- Improved metrics for monitoring personnel operating tempo for force management are needed.

The Army has met its obligations with repeated deployments, which many observers say strains the Army and its personnel.

The U.S. Army is heavily engaged globally, with active- and reserve-component personnel involved in about 80 countries. While troops have recently left Iraq, other commitments remain substantial.

The Army has met these obligations with repeated deployments, a practice that many observers say strains the Army and its personnel. To address these concerns, DoD asked NDRI to assess the use of active and reserve forces and to analyze ways of adjusting the mix of capabilities to both alleviate this strain and meet DoD's deployment objectives.

Relying on DoD personnel data and the research literature, NDRI researchers pursued three lines of inquiry:

- Are some personnel being deployed or mobilized more than others? Which occupations are most- and least-heavily deployed or mobilized?
- Do utilization rates exceed the Secretary of Defense's planning objectives?
- How much could these rates be reduced by rebalancing forces from high- to low-utilization areas?

The Measurement Challenge

The Secretary of Defense has outlined planning objectives for the extent to which personnel will be deployed or activated. For active-component personnel, the expectation is that for every year individuals are deployed, they will spend two years at home (a ratio of 1:2). For reserve-component personnel, the expectation is that for every year mobilized, they will spend five years demobilized (a ratio of 1:5). Currently, both components are believed to be exceeding these goals (that is, personnel are spending more of their time deployed or mobilized).

While these statistics are conceptually straightforward, accurately measuring them is not trivial. The central challenge in identifying whether individuals have exceeded the planning objective is that their experience must be measured over time. However, at a specific point, there are many individuals for whom not enough time

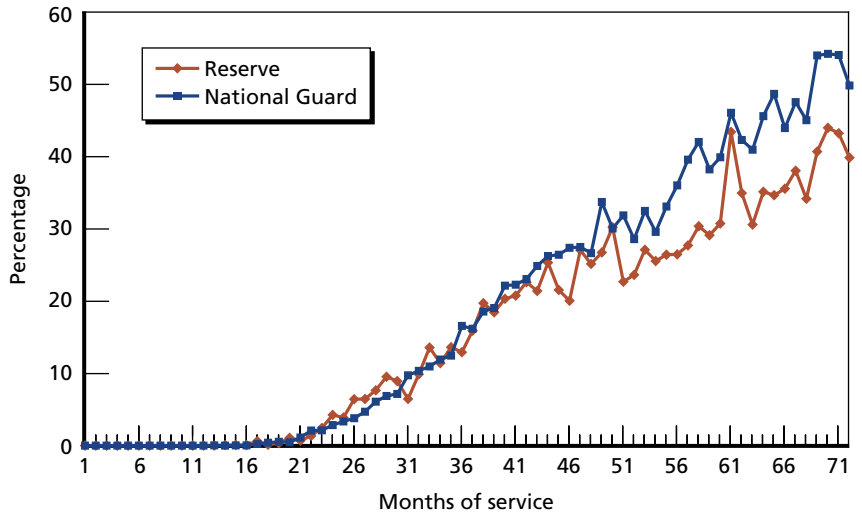
has yet elapsed to determine whether they will exceed the planning objective. In other words, some individuals may have *not yet* exceeded planning objectives. Others have had lengthy deployments or activations but not enough offsetting dwell time. Therefore, while existing metrics and databases can provide information on individual histories, none describes the extent to which individual service members will meet or exceed the planning objectives.

Current Use of Capabilities

Overall, the research team found that, as of December 2008, about 9 percent of active-component personnel had been mobilized for durations exceeding the DoD planning ratio of 1:2. The situation was even more dramatic for the reserves: Eighteen percent of Army Reserve and Army National Guard members had exceeded their 1:5 ratio—and approximately 6 percent had exceeded 1:2, the active-duty planning objective.

Length of service explains some of these findings. The figure shows the percentage of reserve-component personnel with more than 12 months of activation—that is, the time allowed in a six-year mobilization cycle, according to the 1:5 planning objective. As tenure lengthens, there is a rise in the percentage of personnel whose time spent activated exceeds the planning objective.

Differential demand for certain skills, many of which are in higher concentrations in the reserves, is a factor. The researchers combined four different statistics of deployment and activation to identify high- and low-utilization skills (i.e., those used more or less than the average within a component). Some high-utilization career fields are common across components. In the active component and Army National Guard, for example, combat arms fields—infantry, armor, and field artillery—are highly utilized. The analysis suggests that the Army Reserve is the most unbalanced component: It mobilizes service members in its high-utilization career fields disproportionately more than the component average.



As tenure lengthens for reserve-component personnel, there is a rise in the percentage whose activation time exceeds the 1:5 planning objective (one in five years spent mobilized).

Forces and Resources Policy Center

Options for Rebalancing

In principle, it is feasible to rebalance components by increasing end strength, by converting billets from low- to high-utilization career fields, or by combining these two strategies. However, the NDRI research team concluded that the Army will likely not receive sufficient manpower authorizations and resources to reduce the burden on high-utilization career fields completely; the Army is currently planning to reduce end strength, not increase it. Converting billets from low- to high-utilization career fields within each component could partially, but not completely, rebalance the components. This is because the number of billets needed to bring all high-utilization careers to the component average exceeds the number available in low-utilization career fields.

For both the active and reserve components, it may be possible to rebalance *across* components, converting billets from a low-utilization career field in one component to a high-utilization career field in another. However, additional factors—not just the current operating environment—should help determine whether any rebalancing should occur. Components are sized and structured to meet not only current but also anticipated future demands. Furthermore, there are some practical principles that may guide the assignment of future missions and capabilities to the active or reserve component; cost may play a role as well.

Michael L. Hansen Project Leader

For more information, see *Reshaping the Army's Active and Reserve Components*, Michael L. Hansen, Celeste Ward Gventer, John D. Winkler, and Kristy N. Kamarck, MG-961-OSD, 2011. Online at www.rand.org/pubs/monographs/MG961.html

Addressing Psychological Health and Traumatic Brain Injury Among Service Members and Their Families

- DoD currently sponsors or funds more than 200 programs to address psychological health and traumatic brain injury.
- There is duplication of effort across programs, both within and across the military services.
- Challenges to maximizing the effectiveness of these programs include their decentralized nature and the lack of a process to systematically develop, track, and evaluate program effectiveness.
- Improved coordination, information-sharing, and evaluation are key to expanding efforts to better support service members and their families.

Over the past decade, U.S. military forces have engaged in extended conflicts with increased operational tempos. While most military personnel have coped well, many have experienced and will continue to experience difficulties related to post-traumatic stress disorder (PTSD) or major depression. Others live with the consequences of traumatic brain injury (TBI). Deployment may also have consequences for military families, particularly for marriages and the well-being of spouses and children.

In recent years, DoD has implemented numerous programs to support service members and their families with a variety of approaches to addressing psychological health. An ongoing challenge is to identify and characterize the scope, nature, and effectiveness of these activities. To address this need, the Assistant Secretary of Defense for Health Affairs asked NDRI for assistance.

The research team identified and characterized more than 200 programs and described a number of barriers to maximizing their effectiveness. It then provided recommendations for clarifying the role of programs, examining gaps in routine service delivery, reducing barriers faced by programs, and building the evidence for their effectiveness.

It is an ongoing challenge to identify and characterize the scope, nature, and effectiveness of programs that address psychological health.

What Is the Role of Support Programs?

To better understand the types of services provided, the researchers grouped programs based on their mission, goals, and activities. They identified three broad areas of focus: preventing problems, identifying individuals in need and connecting them to care, and providing care for service members and families in need. These areas were broken down into themes and then further into 23 key activities in which programs engage, including improving resilience, preventing domestic violence, operating a telephone hotline, and conducting screening for mental health problems.

The study found duplication of effort across programs. For example, many programs focus on providing training or on improving resilience (see p. 35 for a separate project on this topic). In general, fewer programs focus on TBI than on issues associated with psychological health (e.g., depression, PTSD, substance use). This is because care for TBI is largely provided within the military health system rather than as part of special programs. Many programs focus on nonclinical issues related to families or children.

Barriers to Maximizing the Effectiveness of Programs

The analysis identified a number of potential barriers that should be addressed to maximize program effectiveness:

- **Decentralization.** Program representatives often noted that they did not know whether others in the DoD community had similar programs that they might learn from.
- **Informal ties to the existing care system.** Most programs are not formally linked to clinical or supportive counseling services, which could affect referrals to follow-up care.
- **Barriers to providing services.** These included inadequate resources, concerns about stigma, and time constraints on both participants and providers.
- **Infrequent evaluation.** Fewer than one-third of programs reported having had an outcome evaluation in the prior 12 months.

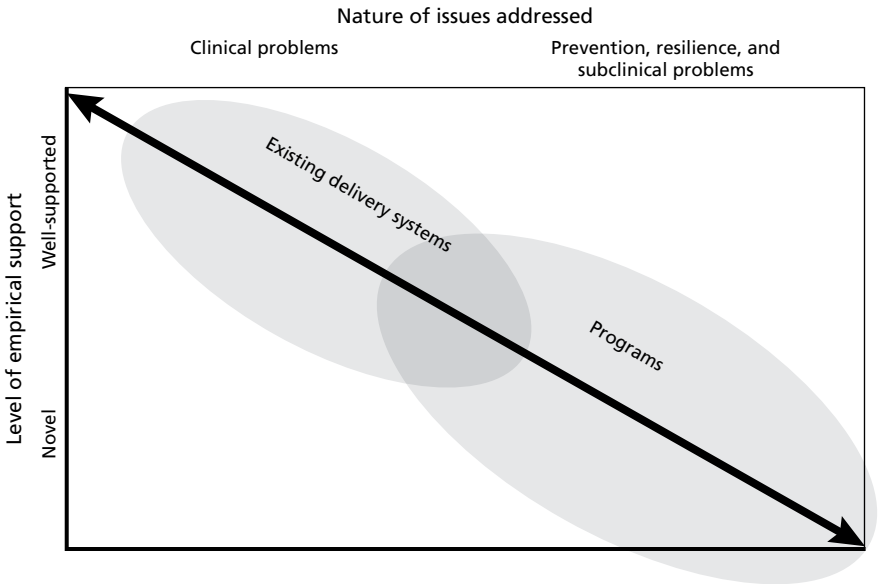
Recommendations

The NDRI research team identified several high-level priorities for DoD.

Take advantage of programs' capacity to support prevention, resilience, early identification of symptoms, and help-seeking. The strength of existing programs could be better leveraged. The figure presents an idealized characterization of services provided by programs and by the health care system, including clinical care and supportive counseling. Under this framework, most health care provided should consist of treatment approaches supported by empirical evidence. Programs, in comparison, offer opportunities to test new approaches to psychological health and TBI care and can help build the evidence base for both clinical and nonclinical approaches. Programs can also play a unique role in the early identification of symptoms and in the areas of prevention and resilience.

Under the framework, programs would test new approaches or offer preventive services in psychological health and TBI care while the current delivery system focuses on clinical problems and treatment approaches that are supported by empirical evidence.

Ideal Characteristics of Services Provided by DoD Programs and by the Existing Delivery System



Establish clear, strategic relationships between programs and the mental health and TBI care delivery system. Programs should complement or supplement existing services. Ensuring appropriate referrals and transitions between providers and care settings is essential for ensuring that participants' needs for care are met and that their care is continuous and coordinated.

Examine gaps in routine service delivery that could be filled by programs. A comprehensive needs assessment should be conducted across DoD to establish the magnitude of demand for different services and the characteristics of individuals in need and their locations. A subsequent formal gap analysis would provide an understanding of the extent to which existing programs meet these needs and where gaps warrant the development of new programs.

Reduce barriers faced by programs. DoD should continue efforts to reduce the stigma and institutional barriers associated with seeking treatment for mental health problems. It may be helpful for DoD training messages to focus on such problems as part of a range of reactions to stress and to emphasize help-seeking as an appropriate response.

Evaluate and track programs and use evidence-based interventions to support program efforts. The evidence base regarding program effectiveness needs to be further developed. Existing programs and those under consideration for development should be required to conduct ongoing evaluations addressing what works well, any unanticipated consequences, opportunities for improvement, and lessons learned that are pertinent to the program's transfer to new environments.

The evidence base regarding program effectiveness also needs to be centralized and made accessible across DoD. New programs should be built on the existing evidence base wherever possible and should focus on replicating programs that have been shown to be effective or on using new treatments or materials that are developed explicitly as pilot programs with appropriate plans for evaluation.

Programs that prove to be ineffective should be discontinued and not replicated. To this end, and to avoid duplication of effort and identify best practices, DoD should identify a central authority to coordinate programs, centralize the evidence base on program effectiveness, and track ongoing programs.

The evidence base regarding program effectiveness needs to be centralized and made accessible across DoD.

Robin M. Weinick and Carrie M. Farmer Project Leaders

For more information, see *Programs Addressing Psychological Health and Traumatic Brain Injury Among U.S. Military Servicemembers and Their Families*, Robin M. Weinick, Ellen Burke Beckjord, Carrie M. Farmer, Laurie T. Martin, Emily M. Gillen, Joie Acosta, Michael P. Fisher, Jeffrey Garnett, Gabriella C. Gonzalez, Todd C. Helmus, Lisa H. Jaycox, Kerry Reynolds, Nicholas Salcedo, and Deborah M. Scharf, TR-950-OSD, 2011. Online at www.rand.org/pubs/technical_reports/TR950.html

How Much Does Military Spending Add to Hawaii's Economy?

- In fiscal years 2007–2009, DoD expenditures in Hawaii averaged approximately $6.5 billion per year in 2009 dollars. Roughly two-thirds of that was for personnel, and the rest was for procurement.
- These expenditures were associated with $12.2 billion of output and approximately 100,000 full-time-equivalent jobs.
- Because of data limitations, these estimates may be somewhat generous.
- Because the models used in this research describe associations between demand and output, not causal effects, this analysis cannot be used to predict with confidence the implications of changes in defense spending for Hawaii's economy.

RAND assessed the relationship between defense spending in Hawaii and the levels of output, employment, and earnings in Hawaii's economy.

Defense activity in Hawaii may account for a significant portion of the state's overall economic activity, but the extent of this association has not been assessed since 1963. Therefore, the Hawaii Institute for Public Affairs and the Military Affairs Council of the Chamber of Commerce of Hawaii asked RAND to assess the relationship between DoD spending in Hawaii and the levels of output, employment, and earnings in Hawaii's economy.

How the Analysis Was Conducted

Data. To accomplish this task, RAND researchers collected data on defense spending in Hawaii in fiscal years 2007–2009 and then analyzed the data using the regional input-output model for Hawaii. Data on defense personnel and procurement were obtained from the Defense Manpower Data Center and the Federal Procurement Data System. Personnel data comprise expenditures for active-duty personnel serving in Hawaii, members of the Hawaii Selected Reserve, and DoD civilian employees, as well as retirement benefits paid to military retirees residing in Hawaii. Defense procurement expenditure data include all contracts greater than $3,000 in which Hawaii is designated as the principal location for the work.

The Model. The regional model is maintained by the Bureau of Economic Analysis at the U.S. Department of Commerce and was most recently updated with 2006 data. Like other input-output models, it describes relationships among the industries in an economy and end-use (final) demand. The model assumes that production functions are linear, have constant returns to scale (doubling inputs doubles output), and use inputs in fixed proportions. It does not address price adjustments in input and output markets or changes in technology. The RAND analysis assumed that when defense procurement and personnel dollars enter Hawaii's economy, they follow the same relationships among industries as reflected in the model. The model's coefficients and multipliers describe *associations* between final demand and output rather than causal effects. Therefore, although the model is useful for assessing the relationship between defense spending and Hawaii's output, earnings, and employment, it does not consider the *effect* of changes in defense spending on the economy.

Plugging Defense Spending into the Model. The analysis treated defense spending as an end-use demand. Defense spending on procurement has a direct impact on industries in which the procurement occurs and an indirect impact on other industries. Spending on personnel follows a similar pattern. DoD personnel and retirees use their wages and benefits to purchase goods and services that generate further economic activity. Data on the consumption patterns of defense personnel were not available, so the analysis relied on the consumption profile in the Hawaii input-output model, adjusting for health care expenditures, the outflow from Hawaii of housing allowance dollars paid for privatized military housing, and per diem payments to military personnel en route to or departing from Hawaii. The adjusted consumption profile was then used to allocate defense spending on personnel to industry classes, and the procurement profile was adjusted to include DoD expenditures on health care for defense personnel.

What the Analysis Showed

The findings showed that estimated DoD expenditures in Hawaii in fiscal years 2007–2009 averaged $6.5 billion per year in 2009 dollars—approximately $4.1 billion for personnel and $2.4 billion for procurement.

The expenditures were associated with $12.2 billion of the output of Hawaii's economy, $3.5 billion in earnings, and the full-time-equivalent employment of approximately 100,000 people (as shown in the table). The output constituted 18.4 percent of Hawaii's 2009 gross domestic product. These figures may be somewhat high, however, because of data limitations.

The table also shows the average multipliers for defense spending. These are summary measures of the relationship between defense spending and output, earnings, and employment. The output multiplier for total spending (1.87) was obtained by dividing the $12.2 billion in output by the $6.5 billion total of defense spending. That is, each dollar of defense expenditure was associated with an additional 87 cents worth of output. The earnings multiplier (0.54) reflects the earnings associated with each dollar of defense expenditure; it does not include the earnings of defense per-

DoD expenditures in Hawaii on personnel and procurement have multiplier effects on output, earnings, and employment.

Impact of Defense Expenditures on Hawaii's Economy

	Personnel	Procurement	Total
DoD expenditure (2009 $ billions)	4.074	2.452	6.527
Final-demand output (2009 $ billions)	7.439	4.781	12.220
Final-demand earning (2009 $ billions)	1.957	1.549	3.506
Final-demand employment	61,902	39,631	101,533
Average multiplier			
Final-demand output	1.83	1.95	1.87
Final-demand earnings	0.48	0.63	0.54
Final-demand employment	16.13	17.16	16.52

NOTE: The employment multiplier is full-time-equivalent employment per million dollars of expenditure in 2006 dollars.

sonnel. The employment multiplier (16.52) indicates that 16.5 jobs were associated with each million dollars of defense expenditure. The table also shows the multipliers for personnel and procurement expenditures.

Cautions in Interpreting the Results

The sensitivity of the estimates was tested against a number of factors, including undercounting or overcounting defense procurement, Hawaii state taxes paid by defense personnel, the savings rate among defense personnel, federal Impact Aid funding for Hawaii schools, spending by afloat and deployed personnel, and procurement by commissaries and exchanges. The sensitivity analysis suggested that two factors—the savings rate among personnel and where the earnings of afloat and deployed personnel are spent—could decrease overall defense expenditures in Hawaii by approximately 10 percent. In addition, the consumption profile for defense personnel may not be fully accurate, as it was not specifically derived for them. Collection of original data and further analysis would be required to resolve these data limitations.

Finally, although the input-output model can provide a good assessment of the relationship between defense spending and Hawaii's output, earnings, and employment, it should not be used as a basis for estimating the effect of a given increase or decrease in defense spending on Hawaii's economy. An analysis of such a change should be based on a detailed structural model of the industries affected by the change, and such a model is not always available. The results should not be taken to suggest that a $1.00 increase in defense spending will increase Hawaii's output by $1.87.

Estimating the effect of a change in defense spending should be based on a detailed structural model of the industries affected.

James Hosek Project Leader

For more information, see *How Much Does Military Spending Add to Hawaii's Economy?* James Hosek, Aviva Litovitz, and Adam C. Resnick, TR-996-OSD, 2011. Online at www.rand.org/pubs/technical_reports/TR996.html

Intelligence Policy Center

John Parachini, Director
Intelligence Policy Center

Over the past year, the United States has been shaping its course in Afghanistan in anticipation of the drawdown of forces that has now begun, while the U.S. military presence in Iraq has wound down completely. Meanwhile, the leadership succession on the Korean peninsula adds an additional dimension of uncertainty to the enigma of North Korea's intentions. At home, officials are struggling to understand and contain the damage wrought by the Wikileaks releases and attacks on the U.S. cyber infrastructure. To respond to trends and events such as these, senior U.S. policymakers turn to the Intelligence Community—its leaders and the thousands of professionals serving under them—for the collection and analysis of vital information to support decisionmaking. In many ways, the policy challenges faced by the United States are unprecedented in their diversity, and the IC must labor mightily to provide insight, warning, and context for senior decisionmakers and operational forces in the field. The IC must both address these daily needs and conduct long-term assessments.

NSRD's Intelligence Policy Center (IPC) helps IC analysts and decisionmakers understand the external environment and manage the IC enterprise. The external environment is characterized by shifting operational environments in current conflict zones and other emerging threats around the globe that are as varied as nuclear smuggling, unrest in the Middle East, and financial crises. The center also helps defense intelligence officials anticipate the demands of policymakers and warfighters across a range of future eventualities. The intelligence capabilities needed for many missions may require years to develop and put in place. But the IC must also strive to be relevant for future threats in all their manifestations, not just augment capabilities that were used during the last war. RAND plays a critical role in supporting the community in exercises and studies across this spectrum of challenges. IPC has become a place for the IC to turn for rigorous methodological approaches to vexing problems and innovative options to address them.

SOME RECENT AND ONGOING PROJECTS

Assessing Counterinsurgency Campaigns

Campaign assessments help decisionmakers in DoD, Congress, and the executive branch shape what tend to be difficult and lengthy counterinsurgency (COIN) campaigns. Assessment informs critical decisions, including the allocation of resources and major shifts in strategy. However, the complex and chaotic environment of the typical COIN campaign presents vexing challenges to assessment. NDRI conducted a comprehensive examination of COIN assessment as practiced through early 2011, as described in the literature and doctrine, and as applied in two primary case studies (Vietnam and Afghanistan).

The analysis found weaknesses and gaps in the centralized, quantitative approach that has typically been used for COIN assessment. In particular, context is critical in COIN: Varying conditions at the local level—and not just broad trends—describe the course of a campaign. Therefore, campaign assessment must capture and reflect relevant local context. Moreover, measurement does not equal assessment; traditional approaches to assessing the progress of COIN campaigns that rely on aggregated quantitative data may obscure important strategic details, as shown in the figure.

The author proposes an alternative process—contextual assessment—that accounts for the realities of the COIN environment and the needs of both policymakers and commanders. This technique does away with sole reliance on aggregated quantitative metrics and instead reflects all available data (quantitative and qualitative) and commanders' input through layered contextual narratives from the battalion to the theater level.

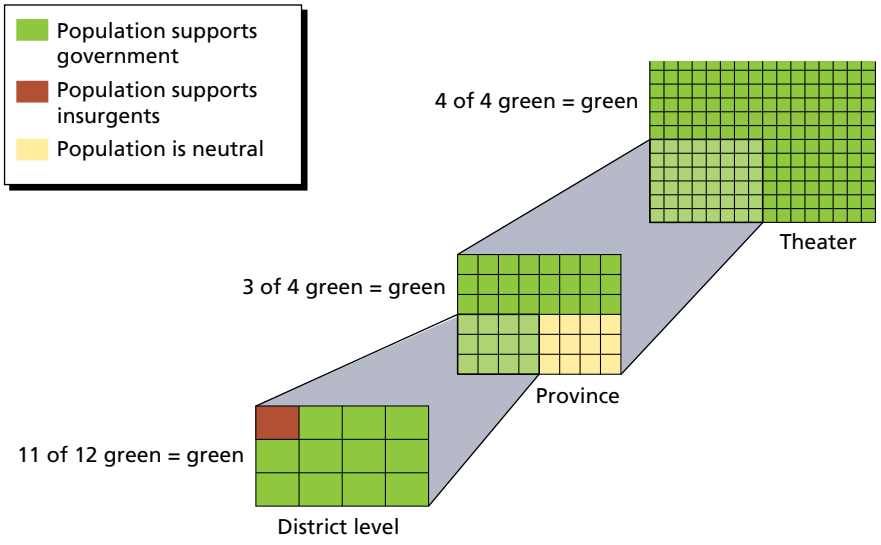
Since the study was completed in mid-2011, various elements of DoD have published new doctrine on assessment, some of which addresses the criticisms raised in the NDRI report. The International Security Assistance Force in Afghanistan has also revamped its assessment process.[14]

SPONSOR: U.S. Department of Defense
PROJECT LEADER: Ben Connable

Explaining China's More Assertive Foreign Policy

With the onset of the global financial crisis of 2008, the People's Republic of China, by many accounts, adopted a more hardline foreign policy. But by the end of 2010, this assertive turn subsided as swiftly as it had emerged, and China reverted to a more conciliatory approach. What explains these policy fluctuations? What happened to China's insistence that it was committed to a "peaceful rise" (or "peaceful development")? What became of Beijing's highly touted "charm offensive"? NDRI undertook a study to address these questions. In particular, the study tested the hypothesis that the aggressive turn in China's international strategy was a function of its leaders' and leading analysts' assessments that U.S. staying power, alliance commitments, and willingness to employ force had lost credibility—in other words, that the U.S. military deterrent in the Asia-Pacific region was no longer effective due to an erosion of the will to fight.

NDRI researchers explored this hypothesis and others in interviews with academics and think-tank analysts in China (both Beijing and Shanghai) and also surveyed articles by Chinese experts writing in policy journals. The results were mined for implica-



NOTE: The data in the figure are notional.

Aggregating data can hide important meaning and context when attempting to characterize popular support for the counterinsurgency.

tions for the future of U.S.-China relations, taking into account China's upcoming leadership transition. The paper resulting from this study has been submitted for publication to a leading international relations journal.

SPONSOR: U.S. Department of Defense
PROJECT LEADER: Scott Harold

Potential Disruptions in the Supply of Critical Raw Materials

The U.S. economy, like any other, is driven by the consumption and transformation of raw materials. At the beginning of the 20th century, the manufacturing of finished goods was principally a local process. In today's manufacturing sector, the path from raw materials to final product can (and typically does) span numerous regions and countries. It is important to both the U.S. economy and national security to identify potential scarcities or disruptions of access to critical raw materials that may occur as a result of government instability or political manipulation. However, it is equally important to consider barriers to intermediate or semi-finished products that may inhibit or limit access to critical final products. NDRI undertook an investigation to analyze current and potential sources of raw materials that are critical to the U.S. economy and national security and to consider possible disruptions in the supply of these materials, together with potential U.S. responses, including mitigating measures.

The research team built on numerous previous studies identifying critical materials by combining two standard indexes—one of supplier concentration and the other of quality of governance. This approach permitted an identification of nations of concern that control a majority share of specific critical materials. The project is developing case studies of one country of concern using one critical material as an example, including an analysis of trends in production, imports, exports, consumption, and additions or subtractions from inventories.

SPONSOR: National Intelligence Council
PROJECT LEADER: Richard Silberglitt

Food Security Through 2040

NDRI researchers recently investigated the extent to which changes in agricultural availability (supplies of key agricultural commodities) are likely to affect food security and stability in 35 countries of interest specified by the National Intelligence Council. This project had three key components. First, it identified seven commodities that are most likely to affect food security and stability in the selected countries. Second, it examined the environmental, political, economic, and technological changes likely to affect the availability of these key commodities in the near (2020), medium (2030), and long (2040) terms. Third, based on a review of the relationship between food security and political/civil instability, the research team estimated how stability in the countries of interest could be affected by predicted changes in the seven identified commodities. The resulting report contributed to a broader study by the sponsor investigating the implications of agricultural availability and food security for U.S. national security.

The United States is a net exporter of agricultural products.

SPONSOR: National Intelligence Council
PROJECT LEADER: Daniel Egel

14 For more information, see *Embracing the Fog of War: Assessment and Metrics in Counterinsurgency*, Ben Connable, MG-1086-DOD, 2012. Online at www.rand.org/pubs/monographs/MG1086.html

Assessing Military Information Operations in Afghanistan, 2001–2010

- Efforts to win the support of the Afghan population for U.S. and allied military operations have had mixed success.
- The most successful initiatives were those involving face-to-face communication.
- The most notable shortcoming was the inability to effectively counter Taliban propaganda against U.S. and NATO forces regarding civilian casualties.
- Inadequate coordination, long response times for message approval, and an inability to exploit informal, oral communication were among the most significant problems with these initiatives.

From the outset of military operations in Afghanistan, U.S. leaders have recognized the importance of winning the support of the Afghan population, and efforts to do so have been an important part of these operations. DoD requested an assessment of these efforts so that it could hone its messages to sway the population in supporting Afghanistan's government. Accordingly, NDRI researchers reviewed the effectiveness of U.S. military information operations (IO), focusing on psychological operations (PSYOP, now called military information support operations) from late 2001 through 2010. Since 2010, there have been changes in the definition, doctrine, organization, and practice of IO and PSYOP in the field, reflecting the findings of various assessments, including the one conducted by RAND.

The research team summarized the diverse PSYOP initiatives undertaken by the U.S. military, identified their strengths and weaknesses, and made specific recommendations for improvement. Special attention was paid to how well PSYOP initiatives were tailored to target audiences, particularly Pashtuns, who are the dominant population in Afghanistan's conflict areas and the main source of support for the Taliban insurgency. The study also examined IO and PSYOP doctrine and organization impact on the effectiveness of messaging.

The biggest PSYOP successes were in face-to-face communication, including meetings with local councils of elders.

The Performance of U.S.-Led Information Efforts

How has the United States performed in the information war in Afghanistan? The results have been mixed. There were some very successful operations, but others did not resonate with target audiences or even had counterproductive effects.

Overall, U.S. information efforts did not succeed in convincing most residents of contested areas to side decisively with the Afghan government and its allies against the Taliban. Even when PSYOP messages were delivered well, their credibility was undercut by concern that the Afghan government would not be able to protect civilians from the Taliban after a U.S. and NATO force withdrawal. Although civic action and development projects were appreciated, some surveys suggested that Afghans viewed the Taliban *and* U.S. and NATO forces negatively.

The biggest PSYOP successes were in face-to-face communication, including meetings with *jirgas* (local councils of elders), key-leader engagements, and establish-

ing individual relationships with members of the Afghan media. The practice of having every infantryman be a PSYOP officer was also effective.

The most notable shortcoming was the inability to effectively counter Taliban propaganda against U.S. and NATO forces regarding civilian casualties. Communications offering rewards for information on terrorist leaders also proved ineffective.

PSYOP communications were more effective when they reflected Afghans' yearning for peace and progress. At the same time, Afghan society is not homogenous but, rather, divided by ethnicity, tribe, and region. These characteristics affect target audience selection and analysis.

The key audience for counterinsurgency messages was Pashtuns, who account for 42 percent of the population and inhabit areas where the Taliban is strongest. Failure to adequately incorporate Pashtun perceptions and attitudes can diminish the effectiveness of communications.

There was variation in message themes and effectiveness over time (as shown in the table). Such themes as the promotion of democracy and participation in elections had better audience reception from 2001 to 2005 than in later years, including during the elections of 2009 and 2010.

Interviews with personnel who served in Afghanistan found that there was inadequate coordination of IO and PSYOP, long response times for message approval, a lack of integration in operational planning, a lack of measures of effectiveness, and an inability to exploit informal, oral communication. For example, under the PSYOP coordination system during the period examined in the study, leaflets that could have had a significant effect if produced within 24 hours and distributed immediately thereafter took as long as a month to produce. Informal, oral communication was also critical among a population with limited access to mass media besides radio.

U.S. PSYOP efforts have varied in effectiveness according to the message conveyed; some themes have become less effective with the passage of time.

Assessment of Major Themes in Psychological Operations

Theme	Assessment
The war on terror justifies U.S. intervention.	Ineffective
Coalition forces bring peace and progress.	Effective (2001–2005); Mixed (2006–2010)
al Qaeda and the Taliban are enemies of the Afghan people.	Mixed
Monetary rewards are offered for the capture of al Qaeda and Taliban leaders.	Ineffective
Monetary rewards are offered for turning in weapons.	Mixed
Support of local Afghans is needed to eliminate improvised explosive devices.	Mixed
U.S. forces have overwhelming technological superiority over the Taliban.	Effective (2001–2005); Mixed (2006–2010)
The government of the Islamic Republic of Afghanistan and Afghan National Security Forces bring peace and progress.	Mixed
Democracy benefits Afghanistan, and all Afghans need to participate in elections.	Effective (2001–2005); Mixed (2006–2010)

Recommendations to Improve the Effectiveness of Information Campaigns

The study's findings point to several ways to improve the effectiveness of U.S. IO and PSYOP campaigns:

- Identify and describe best practices for IO and PSYOP based on the experiences of personnel who have served in Afghanistan.
- Use local focus groups to pretest messages. Failure to account for the cultural, social, political, and religious characteristics of target audiences is a major deficiency in PSYOP campaigns. Using focus groups to pretest messages can help hone messages, although care must be taken to ensure that focus group membership reflects the target audience.
- Conduct and use the results of public-opinion surveys for target-audience analysis and post-testing. Considerable polling and interviewing has been conducted in Afghanistan, some of it sponsored by the U.S. military, and there has been significant work on human terrain mapping and cultural intelligence. These data could be much better used to develop PSYOP themes and messages. Surveys should be keyed to specific PSYOP campaigns. Because target audiences may vary by region, surveys should also focus on district-level rather than national-level populations.
- Use key communicators to help develop and disseminate messages. Messages are more credible if they come from a figure who already enjoys prestige among the target audience and is already considered a trustworthy source of advice and information. Key communicators could include Islamic clerics, traditional chiefs, educated schoolteachers, wealthy merchants known for providing charity, or government officials.
- Harmonize IO doctrine and practice, and implement greater integration with PSYOP and public affairs. Closer coordination between PSYOP and public affairs could particularly enhance counterpropaganda effectiveness.

Messages are more credible if they come from a figure who already enjoys prestige among the target audience.

Arturo Muñoz Project Leader

For more information, see *U.S. Military Information Operations in Afghanistan: Effectiveness of Psychological Operations, 2001–2010*, Arturo Muñoz, MG-1060-MCIA, 2012. Online at www.rand.org/pubs/monographs/MG1060.html

An Organizational Review of U.S. Marine Corps Intelligence

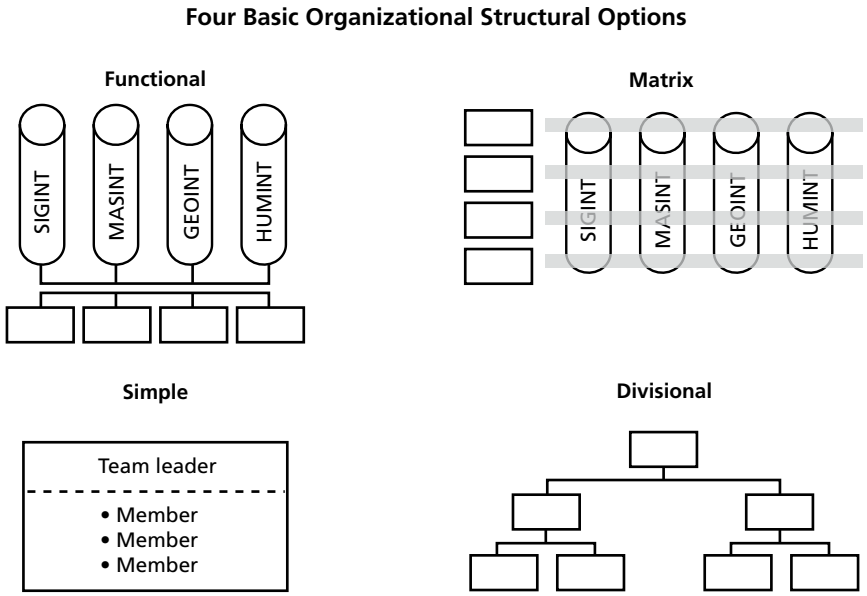
- The structures of several Marine Corps intelligence organizations need to be realigned with evolving missions and strategic intent.
- The Marine Corps Intelligence Department has grown rapidly and reactively, and it could benefit from a realignment of its functional structure.
- A specialized matrix organization could help bring the Marine Corps Intelligence Activity in line with customer orientation.
- At the level of the Marine Expeditionary Force, intelligence functions should be integrated across disciplines in company-level units linked in habitual support relationships with particular regimental combat units.

NDRI reviewed how best to align Marine Corps intelligence structures to execute missions and functions.

U.S. Marine Corps intelligence has wide-ranging responsibilities, including representing the Marine Corps in the national intelligence community and in DoD resource allocation processes, as well as supporting the tactical needs of expeditionary forces deployed around the world. Particularly since 2001, the Marine Corps intelligence enterprise has demonstrated agility in tailoring its organization to meet evolving expeditionary force demands. At the same time, the Marine Corps has grown in strength, and the number of marines with intelligence military occupational specialties has doubled. This has resulted in a number of ad hoc arrangements, practices, and organizations, encompassing operations in irregular, amphibious, joint, and coalition warfare. The demands of these operations, combined with the increasingly rapid pace of technological change, have challenged Marine Corps intelligence capabilities in meeting requirements.

The Marine Corps Director of Intelligence asked NDRI to review how best to align Marine Corps intelligence structures to efficiently and effectively execute current and future missions and functions. The study considered four organizational levels: (1) the Intelligence Department (the Director of Intelligence and immediate staff), (2) the Marine Corps Intelligence Activity, (3) the intelligence and radio battalions in the Marine Expeditionary Forces, and (4) the combat elements, including air and logistics but primarily the ground combat element. The first two organizations are located at Marine Corps headquarters.

NDRI researchers approached the analysis by assessing how well each organization was suited to its goals, strategy, resources, authority, and the environment in which it operates. Goals focus on either the product (effect) or the process (efficiency), or a combination of the two. Strategies have many components, but what is important is the balance between exploration and exploitation—that is, whether the strategy takes the initiative (explores) or plays by the rules (exploits). An ability to pursue goals and follow strategies depends on resources and authorities, and the questions are whether an organization has sufficient resources and authorities to carry out its functions. An organization can change its goals, strategies, resources, and authorities, but context determines the environment. Key concerns here are the environment's complexity and predictability. These elements vary for each of the organizations



The literature on organizational design describes four basic structural options.

NOTE: SIGINT = signals intelligence; MASINT = measurement and signature intelligence; GEOINT = geospatial intelligence; HUMINT = human intelligence.

examined and, thus, the structure should vary accordingly. The four basic structural models considered for application to the different organizations are shown in the figure.

How Well Are Marine Corps Intelligence Organizations Aligned with Their Missions?

The research team found that several Marine Corps intelligence structures need to be realigned with their evolving missions, which led to several suggestions for organizational improvement. The Intelligence Department, for example, has grown rapidly and reactively rather than in a planned manner. As a result, names of its subordinate elements do not reflect their actual functions, and the organization is difficult for outsiders to understand and engage. The analysis also revealed that the Marine Corps Intelligence Activity needs to increase its customer orientation and faces challenges in prioritizing tasks from its many customers and stakeholders. Intelligence in the Marine Expeditionary Forces needs to find a better balance regarding demands from the higher levels of the chain of command; too often, it remains within comfortable disciplinary boundaries. All of these issues are addressed by the structural changes recommended by NDRI.

What Organizational Changes Would Most Benefit Marine Corps Intelligence?

The Marine Corps Intelligence Department is a functional hierarchy and should stay that way, but opportunistic improvements are needed. The issues and concerns identified in the Intelligence Department can be addressed without changing the nature of the department's functional structure, but rather by realigning it. Specifically, several resourcing functions could be grouped together. Appropriate roles and reporting relationships should be established for senior civilians.

The Marine Corps Intelligence Activity should reorganize into a specialized matrix known as a front-back organization. A front-back organization is designed to accommodate both customer and product effectiveness and functional efficiency. It can also better accommodate absences for training or deployment. Furthermore, it has the advantage of maintaining easy access and habituation with customers but allocates expertise more efficiently, and it allows more functional training and development of expertise because experts are a pooled resource. The ability to manage and monitor customer needs and demands, and to efficiently allocate expertise and resources to meet those demands, is particularly important to the Marine Corps Intelligence Activity, with its host of varied customers.

Marine Expeditionary Forces could be more effective if organized into integrated matrix habitual relationships. A significant change at the Marine Expeditionary Force level would be to integrate functions in the battalion by creating discipline-integrated, company-level units and to associate these units habitually in both general and direct support relationships with particular regimental combat units. In practice, the Marine Corps is familiar with such an integrated structure because it is used elsewhere and is the basic structural form for Marine Expeditionary Unit intelligence capabilities. This structure better supports decentralized decisionmaking and, because the Marine Corps operating concept focuses on the Marine Expeditionary Brigade as the key organization, it provides dedicated and habitual support for that commander.

Finally, the research team identified other issues related to mission, workforce, leadership, culture, and technology that might be construed as organizational in a broader sense and that should be considered in making structural organizational changes.

The ability to manage and monitor customer needs and demands is particularly important to the Marine Corps Intelligence Activity.

Christopher Paul and Harry J. Thie
Project Leaders

For more information, see *Alert and Ready: An Organizational Design Assessment of Marine Corps Intelligence*, Christopher Paul, Harry J. Thie, Katharine Watkins Webb, Stephanie Young, Colin P. Clarke, Susan G. Straus, Joya Laha, Christine Osowski, and Chad C. Serena, MG-1108-USMC, 2011. Online at www.rand.org/pubs/monographs/MG1108.html

Reintegrating Afghan Insurgents

- Reintegration of insurgents into society under the Afghan government can be promoted by addressing grievances, using coercion, and increasing the perception that the government is winning.
- Afghan and coalition forces should proactively seek out individuals or groups that are receptive to reintegration.
- Because the central government may move slowly, tactical units may have to take action to secure reintegration by working with local officials.

The study examined 36 reintegration cases in Afghanistan since 2001, including explanations of why insurgents opted to reintegrate.

A successful counterinsurgency campaign requires getting insurgents to switch sides. Ex-combatants provide an invaluable source of information on their former colleagues, sow discord among them, and ultimately cause momentum to shift toward counterinsurgent forces. Under the sponsorship of the Marine Corps Intelligence Activity, NDRI undertook a brief analysis to examine the factors involved in promoting the reintegration of Taliban and other insurgents into their local communities in Afghanistan and to outline steps to facilitate the reintegration process. In this context, *reintegration* refers to operational and tactical efforts to assimilate low- to mid-level insurgents and leaders peacefully into their local communities. It is generally distinguished from *reconciliation*, which involves high-level, strategic, and political dialogue with senior leaders of major insurgent groups to terminate their armed resistance against the Afghan government.

The analysis adopted a straightforward methodology: It examined 36 reintegration cases in Afghanistan since 2001, including explanations of why insurgents opted to reintegrate. Note that any study of reintegration has methodological and analytical pitfalls. There is no complete data set of reintegration cases, and many cases are not regularly reported—or compiled—by officials in the Afghan government or the International Security Assistance Force (ISAF). In addition, it is not always clear why insurgents reintegrate. Some discussions are clandestine and are conducted with Afghan or other intelligence agencies, and insurgents may publicly or privately misrepresent their reasons for reintegration. Nevertheless, the initial data set represents a step forward that provides a critical lens through which to examine reintegration. The analysis led to several conclusions:

- At least three factors appear to raise the probability of reintegration: (1) increasing the perception that Afghan and coalition forces are winning the war, especially at the local level; (2) using coercion against insurgents, including targeted raids to kill or capture insurgent leaders; and (3) addressing key grievances, such as tribal or subtribal conflicts, employment, security, or governance failures.
- The causes cited for reintegration varied: In 36 percent of the cases examined, insurgents reintegrated because they believed the Taliban or other groups were losing the war (at least in their local areas); in 33 percent of the cases, coercion was a critical factor; and in 71 percent of the cases, insurgents reintegrated because of grievances. (In some cases, more than one cause was identified.)

- Reintegration should not be a *reactive* process in which Afghan and ISAF officials merely respond to individuals or groups that contact them. A better approach would consist of *proactive* efforts to identify individuals as favorable candidates for reintegration. For example, proactive assessments can be used to identify individuals, villages, and even larger entities (such as clans or subtribes) as favorable candidates for reintegration.
- Although reintegration requires Afghan government leadership, the central government is sometimes poorly synchronized with the activities of local officials. Tactical units cannot always wait for the central government to act. Consequently, effective reintegration may require tactical units to cooperate with local officials, provincial and district governors, tribal and community leaders, and officials from the National Directorate of Security, the Afghan National Police, and the Afghan National Army.
- Past reintegration cases suggest that there is a range of helpful procedures once a fighter—or group of fighters—considers reintegration:
  - **Screening of candidates.** Conduct in-depth questioning, contact human sources, analyze databases, and gather biometric and other relevant data. Afghan and ISAF units should be aware that insurgents might use reintegration as a way to attack them, collect intelligence, or stall operations.
  - **Holding and security procedures.** Establish holding procedures. Detention should be used as a last resort and, in some instances, may be counterproductive if it triggers a backlash from local communities. Detainees should be treated fairly, kept safe, and not be punished if they are willing to talk.
  - **Incentives.** Consider a range of financial and other assistance for potential candidates, including resettlement aid and security protection. Afghan programs that support a long-term solution, such as employment or education, can be particularly helpful.

Former insurgents participate in a reintegration shura in Helmand province.

- **Engaging tribal and other local leaders.** Operate through legitimate local institutions, including *jirgas* and *shuras* (local councils), to help resettle reintegrated personnel into villages. Reintegration may be successful only when tribal and other local leaders are involved, supported by the Afghan government and ISAF units, and prepared to stake their prestige to help reintegrate former combatants.
- **Information operations.** Disseminate information that reintegration is a viable option to the local population and neutralize insurgent propaganda. Reintegrated personnel can help create opportunities by demonstrating to insurgents the benefits of switching to the government's side.
- **Active use of reintegrated individuals.** Consider utilizing former insurgents in a range of ways where feasible: to collect intelligence, to participate in local defense forces, to act as scouts, and to accept positions in the Afghan government.

Reintegration is inherently controversial because it requires working with individuals who have been fighting Afghan and coalition forces, but it is a necessary part of a successful counterinsurgency campaign. Furthermore, reintegration can facilitate mobilization of the local population against insurgents, which is also a critical component of counterinsurgency success.

Reintegration is inherently controversial, but it is a necessary part of a successful counterinsurgency campaign.

Seth G. Jones Project Leader

For more information, see *Reintegrating Afghan Insurgents*, Seth G. Jones, OP-327-MCIA, 2011. Online at www.rand.org/pubs/occasional_papers/OP327.html

Homeland Security and Defense Center

Andrew Morral, Director
Homeland Security and Defense Center

Following the 9/11 terrorist attacks, the United States began a complex effort to reform the strategy, tactics, and management of securing the nation's borders, its critical infrastructure, and its people from threats foreign and domestic, as well as natural disasters. This mission is complex and fraught with uncertainty about the nature of the many possible threats, the benefits to be expected from alternative security strategies, and the management processes that will ensure that security is effective and efficient. Strategic planning for homeland security requires balancing cherished principles of freedom, privacy, and due process with responsible federal, state, and local preventive and protective measures. These are complex, often novel, planning problems requiring integrative and cross-cutting analysis. They raise controversial questions about judgments and priorities, meaning that analyses supporting decisionmaking must be transparent, objective, and grounded in a deep understanding of the technical, operational, policy, and historical context. RAND is uniquely capable and experienced in providing the kind of high-level systematic and independent planning and analysis that the nation requires to ensure that decisions are supported by the best available information.

The Homeland Security and Defense Center conducts analysis to prepare and protect the American people and critical infrastructure from terrorism and related threats. Its projects examine a wide range of risk management problems, including coastal and border security, emergency preparedness and response, defense support to civil authorities, transportation security, domestic intelligence programs, and technology acquisition.

The center's clients include the Department of Homeland Security, the Department of Defense, the Department of Justice, and other organizations charged with security and disaster preparedness, response, and recovery. The Homeland Security and Defense Center is a joint center of NSRD and RAND Infrastructure, Safety, and Environment.

Homeland Security and Defense Center

SOME RECENT AND ONGOING PROJECTS

Efficient Aviation Security

Since the 9/11 terrorist attacks, aviation security has remained at the forefront of the national policy agenda. Al Qaeda has maintained its focus on the U.S. aviation system, and a number of attempted attacks on aircraft have been thwarted in the succeeding years. Internationally, there have been successful attacks on aircraft and airports, and continued adaptation and innovation by terrorist groups has presented aviation planners with a shifting risk environment. The frequent adjustments and systematic tightening of security in the aviation system since 9/11 have also put the collateral and intangible effects of security efforts, such as intrusiveness, into the national spotlight. In this context, there has been increased analysis and debate about whether the benefits of new security measures outweigh their costs.

A RAND-initiated study conducted by NSRD sought to contribute to the national debate on aviation security by examining a set of issues that are either overlooked or not well captured in analyses of the costs and benefits of security measures. Among these issues are uncertainty in the costs of security measures and ways to approximate those costs, how different elements in a layered defense interact with each other, deterrence (how security affects attacker choices), the merits of preferential screening (as in a trusted-traveler program), and the use of modeling to understand terrorism risk.

This effort was undertaken from the viewpoint that the goal of aviation security is not just to reduce risk but to do so efficiently. This is particularly important in an era when fiscal constraints require difficult choices between resources spent for security and other important national priorities.

SPONSOR: RAND (Independent Research and Development)

PROJECT LEADER: Brian A. Jackson

Analysts are increasingly questioning whether the benefits of new airport security measures outweigh their costs.

The Role of Nuclear-Weapon Detection Technologies in Deterring Nuclear Terrorism

Concerns about terrorists smuggling nuclear bombs into the United States in container freight have led to demands for 100-percent inspection levels at either U.S. or foreign ports. However, under some circumstances, it may be possible to deter nuclear smuggling attempts with less than 100-percent inspection. A research team from RAND and the University of Wisconsin has quantified a game-theoretic model of terrorist decisionmaking to understand the role of nuclear detection technologies in deterring nuclear terrorism. It differs from past research along these lines in that deterrence is explicitly modeled as a potential benefit of nuclear-weapon detection technologies, and it gives detailed consideration to the conditions under which deterrence can be achieved. Using this model, the research team considered how an adversary's decision regarding whether to undertake a nuclear attack is influenced by defender choices about options for detection and retaliation.

Using publicly available data, the team reached the following conclusions: If the defender cannot impose high retaliation costs on the attacker, 100-percent inspection is likely to be needed. Thus, deterrence with partial inspection may not be achievable in practice even though it is possible in theory. On the other hand, when the defender can credibly threaten the attacker with costly

retaliation, partial inspection may be sufficient to deter nuclear smuggling attempts. Therefore, it is critically important to consider whether it is possible to create a credible threat of retaliation against terrorist adversaries. Sensitivity analysis of the study's results indicated that these observations are robust to assumptions about specific parameters in the model. Thus, in policy discussions about how to prevent nuclear terrorism, it is just as important (if not more so) to consider the diplomatic stance on retaliation as it is to debate the optimal percentage of containers to be inspected.[15]

SPONSOR: U.S. Department of Homeland Security
PROJECT LEADER: Henry H. Willis (for RAND)

A truck passes through a radiation portal monitor during a security screening at the Port of Tacoma in Washington State.

15 For more information, see "Deterring the Smuggling of Nuclear Weapons in Container Freight Through Detection and Radiation," Naraphorn Haphuriwat, Vicki M. Bier, and Henry H. Willis, *Decision Analysis*, Vol. 8, No. 2, June 2011, pp. 88–102.

Analytic Tools for Improving Border Security

- Positioning border patrol personnel and equipment according to historical interdiction data and systematic randomness can yield interdiction rates comparable to those of more expensive alternatives, such as persistent surveillance.
- The benefits of combining pattern analysis and systematic randomness appear particularly strong when the number of available patrols is high relative to the rate of illegal flow but low relative to the size of the border—the circumstances confronted by many border patrol stations.
- The Office of Border Patrol should develop a plan to institute daily patrols based on the analytic tools described here.

Pattern and trend analysis and systematic randomness have been productively employed in various law enforcement contexts, but they come with risks.

The U.S. Department of Homeland Security (DHS) has the responsibility to protect and control U.S. borders against terrorist threats, criminal endeavors, illegal immigration, and contraband. Unfortunately, due to budgetary and other resource constraints, DHS cannot "see and be" everywhere at once along thousands of miles of land border and shoreline. As a result, DHS officials continually face the question of where, when, and how to position people and technology for maximum effectiveness.

To help answer that question, DHS and its Office of Border Patrol (OBP) are investigating how best to use two analytic techniques—pattern and trend analysis and systematic randomness. *Pattern and trend analysis* refers to predictive methods that can identify regularities in the times, places, or tactics that interdicted border crossers have historically employed. *Systematic randomness*, in a sense the antithesis of pattern and trend analysis, refers to the insertion of unpredictability into planning; randomness may allow OBP to explore a sample of illegal activity without the bias of historical trends, make it harder for smugglers to exploit patterns in OBP behavior, and introduce uncertainty into smuggler decisionmaking, thereby increasing risk and possibly deterring illegal activity.

These tools have been productively applied in various law enforcement contexts, but they come with risks: Pattern and trend analysis can mislead decisionmakers if historical apprehension data are not representative of all intrusions. And randomness can waste precious resources if applied carelessly or in excess. Moreover, no two OBP stations face the same challenges, so the productive application of these tools will vary accordingly.

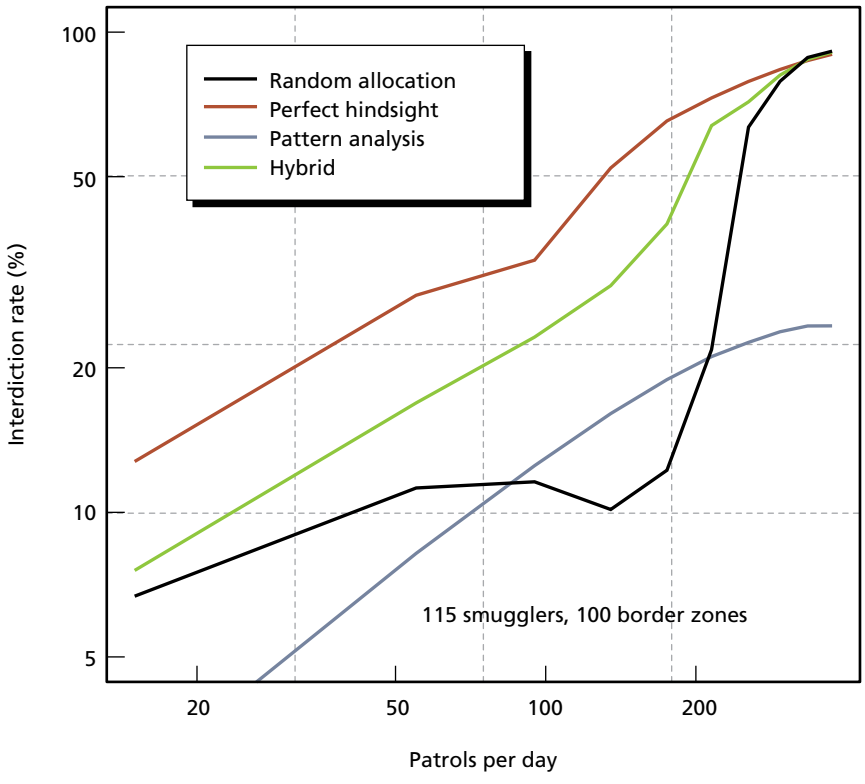
RAND undertook a study of how pattern and trend analysis and systematic randomness could be most effectively used to position border security resources. The research team conducted field studies and discussions with DHS and OBP personnel and collected historical data on interdictions and patrol and station configurations. The team also developed an agent-based simulation model of the interaction of border patrol agents and smugglers. The model allowed the team to explore how interdiction rates differ across thousands of scenarios that vary by the number of patrols,

the rate of illegal flow, the size of the border, and the approach OBP takes to using pattern and trend analysis and systematic randomness.

The figure illustrates some notional results from the model. It shows, for a given number of patrols, the interdiction rates achieved by different approaches to using pattern and trend analysis and systematic randomness. The black line corresponds to allocating resources randomly, without regard to any historical data; the red line represents the interdiction rate for allocation based on pattern analysis of historical crossings, assuming perfect hindsight of both successful and unsuccessful illegal crossing attempts; the blue line shows results for allocating resources according to pattern analysis of historical interdictions; and the green line shows the results of blending pattern analysis of historical interdictions and systematic randomness.

Unsurprisingly, the highest interdiction rates would be achieved by allocating resources based on perfect hindsight (red line in the figure). But attaining perfect hindsight—that is, the ability to document all crossings, successful or unsuccessful—would be very expensive. With a sufficiently large number of patrols, interdiction rates can approach 100 percent under most strategies, but funding large numbers of patrols is also very expensive. However, the model suggests that in nearly all cases, coupling pattern analysis with systematic randomness (green line) yields greater interdiction rates than either approach alone and can be competitive with perfect hindsight in some cases. The relative benefit of coupled approaches appears to be particularly strong when the number of available patrols is high relative to the

The interdiction rate under a strategy combining both pattern and trend analysis and systematic randomness compares most favorably with the rate that would be achieved with perfect hindsight of all previous illegal border crossings.



rate of illegal flow but low relative to the size of the border—the circumstances confronted by many OBP stations. These findings emerged from an analysis of thousands of scenarios that differed based on the size of the border, the local rate of illegal flows, and the number of available patrols.

The analysis also suggests that relative measures, such as coverage (patrols per zone) or capacity (patrols per smuggler), are more important than absolute measures, such as the rate of illegal flow or the size of the border, for predicting interdiction rates. By relative measures, some lower-activity northern border stations with fewer resources are similar to higher-activity southern border stations with more resources.

The researchers recommend that OBP catalog detections, even those that do not result in interdiction, and use these data to improve the overall representation of illegal flows in pattern and trend analysis. Furthermore, they recommend that OBP institute a plan to schedule patrols based on daily pattern and trend analysis and systematic randomness. This plan should include a phase of experimentation using randomized controlled trials, for which the research provides a template experimental design.

The research provides a template experimental design for randomized controlled trials of patrol plans.

Joel B. Predd and Henry H. Willis
Project Leaders

For more information, see *Using Pattern Analysis and Systematic Randomness to Allocate U.S. Border Security Resources*, Joel B. Predd, Henry H. Willis, Claude Messan Setodji, and Chuck Stelzner, TR-1211-DHS, 2012. Online at www.rand.org/pubs/technical_reports/TR1211.html

International Programs

Robin Meili, Director
International Programs

In addition to the five policy research centers described earlier, NSRD houses RAND's International Programs,[16] which facilitates the growth and understanding of RAND's internationally focused research, particularly that funded by sponsors outside DoD and the IC (and often outside the U.S. government). Because this research lies at the intersection of international policy with issues such as transnational trade and investment, education, health care, information technology, and energy and the environment, it often involves multiple research units, and International Programs plays a coordinating role. International Programs includes five centers that promote understanding of RAND's work in their areas of concern:

- The RAND Center for Middle East Public Policy, which supports RAND's research efforts on political, social, economic, and technological developments in and around the Middle East, with an eye to helping advance the domestic research agenda in those countries. Projects have included analyses of such topics as the Arab Spring, economic development and foreign aid, and assistance to governance in locations such as Egypt, Palestine, Qatar, and Saudi Arabia.
- The RAND Center for Asia Pacific Policy, which has helped researchers address issues such as China's economic transformation, modernizing the North Korean system, the defense sector as an engine of economic growth in South Korea, and terrorist networks in Southeast Asia.
- The RAND Center for Russia and Eurasia, which facilitates dialogue on political and economic change in that region, particularly through the RAND Business Leaders Forum, an organization of top corporate executives from Russia, the United States, and Western Europe.
- The RAND Frederick S. Pardee Center for Longer Range Global Policy and the Future Human Condition, whose goals are to improve our ability to think about the future from 35 to 200 years out and to develop new methods for analyzing the potential long-range, global effects of today's policy options.
- The RAND Center for Global Risk and Security, whose goal is to assist researchers in working toward a better understanding of issues such as the security risks of climate change, the challenges of fragile states, and the security implications of the global economic crisis.

International Programs

SOME RECENT AND ONGOING PROJECTS

The Egyptian Military and Democratization After the Revolution

After the overthrow of Egyptian president Hosni Mubarak in 2011, it appeared that the military might aid in instituting a democratic government and yield power to civilian authorities. In the following months, however, the actions of the Supreme Council of the Armed Forces (SCAF) have appeared aimed at muzzling dissent and impeding the transition to democracy. What is the Egyptian military really seeking? Will the SCAF ultimately cede power to an elected government, or is it primarily interested in finding a way to remain the nation's ruling authority?

RAND sought to answer these questions in a project funded through contributions from members of the Center for Middle East Public Policy Advisory Board. The study was conducted by two RAND researchers, both Arabic speakers who have lived in Egypt. Their conclusions were based on a number of interviews conducted in Egypt, including conversations with SCAF generals and members of the various Egyptian political parties. They were among the first non-Egyptian analysts to gain such broad access to the key actors involved in Egypt's postrevolution political landscape.

Egyptian generals from the ruling military council file out of a funeral mass for Coptic Orthodox Pope Shenouda III in Cairo.

The study, the results of which were published in *Foreign Affairs*, was the first to detail the SCAF's strategies to retain control of key portfolios and avoid civilian oversight without formally assuming the role of head of state. For example, according to the authors, the SCAF will shape the democratic timetable and electoral laws to favor parties (e.g., the Muslim Brotherhood) that will not challenge its privileged position. The SCAF will also put former military personnel into office by controlling governorship appointments and maintaining a quota of parliamentary seats for "workers" and "farmers" that are often the preserve of ex-officers. The authors recommend that U.S. leaders leverage the generals' concern for their image by speaking out in approval or disapproval of the SCAF's actions, publicly or privately, as warranted.[17]

SPONSOR: RAND

PROJECT LEADERS: Julie E. Taylor and Jeffrey Martini

Trade Policy Options for the United States and Japan

In November 2011, the prime minister of Japan announced that his country would explore participation in the Trans-Pacific Partnership (TPP), a proposed regional free-trade agreement involving nine Asia-Pacific countries. Joining the TPP could represent a significant step for Japan, which until now has avoided negotiations that might require it to liberalize its heavily protected agricultural markets. A key feature of the TPP is the participants' insistence on eliminating almost all tariffs. The United States has cautiously welcomed Japan's decision to join the TPP negotiations, although U.S. government officials have indicated that they expect Japan to meet the "high standards" of liberalized trade that the pact is aiming for.

That this direction is being charted by two of the world's largest economies and biggest advocates of unfettered global trade will have a profound impact on the fate of the global free-trade regime. To examine the analytic basis for this new direction, RAND investigated the factors that influenced Japan's decision to join the TPP and the U.S. decision to make the TPP a focus of its own trade policy.

The research team looked at four trade policy options that the two nations could have adopted: (1) working together to restart the multilateral Doha Round of the World Trade Organization, (2) signing a bilateral free-trade agreement, (3) participating in the

President Barack Obama meets with Japanese Prime Minister Yoshihiko Noda on November 12, 2011. Noda told Obama about Japan's policy on joining negotiations for the Trans-Pacific Partnership, and Obama welcomed Japan's decision.

formation of the TPP, and (4) pursuing independent trade strategies. The researchers evaluated each option based on its impact on international relations and economic growth and its political and practical feasibility. They concluded that, given the prevailing policy environments in both countries, U.S.-Japanese cooperation through the TPP appears to have the greatest potential to move both countries forward on freeing trade. The choice by both countries to move forward with the TPP is therefore justified on these grounds.[18]

SPONSOR: Japan Foundation Center for Global Partnership
PROJECT LEADER: Rachel M. Swanger

16 As the result of a corporate reorganization, International Programs will, as of the spring of 2012, move out of NSRD and report to the newly created position of Vice President, International.

17 For more information, see "Commanding Democracy in Egypt: The Military's Attempt to Manage the Future," Jeff Martini and Julie E. Taylor, *Foreign Affairs*, Vol. 90, No. 5, September–October 2012, pp. 127–137.

18 For more information, see *The United States, Japan, and Free Trade: Moving in the Same Direction?* Julia F. Lowell, Shujiro Urata, Megumi Naoi, and Rachel M. Swanger, OP-363-CGP, 2012. Online at www.rand.org/pubs/occasional_papers/OP363.html

Understanding China's Investments in U.S. Companies and Protecting U.S. Interests

- China's growing investments in foreign companies have potential benefits for both China and other countries.
- China's foreign investment policy is distinctive in its centralized guidance, selective in the specificity of targeted sectors, and flexible in adjusting both the companies and the countries that are targeted.
- A RAND-developed decision tree can help U.S. analysts assess these investments and their potential benefits and risks to national interests.
- The United States should emphasize a cooperative response from China to plans for mitigating risks based on considerations of reciprocity and mutual benefit.

Recipients of China's foreign investments have concerns about protecting their national economic and security interests.

China has experienced remarkable economic growth over the past 30 years and today is the world's second-largest economy after the United States. As its economy has grown, China has accumulated the world's largest holdings of foreign exchange reserves—more than $2.1 trillion at the start of 2010, one-third larger than those of Japan. These huge holdings enable China to expand its foreign investments and have strengthened its bargaining power in seeking and acquiring companies and other assets abroad.

Recipients of China's foreign investments have concerns about protecting their national economic and security interests, including sensitive technologies and essential natural resources. The resulting challenge for these countries is how to nurture the opportunities for, and potential benefits from, the efficient allocation of Chinese investments while avoiding or sharply limiting possible risks to their national interests.

To contribute to the development of policies and procedures that will promote win-win outcomes and minimize losses, RAND analyzed recent and proposed Chinese investments worldwide, with a particular emphasis on those in the United States, Europe, and Asia.

China's Investment Policy Is Distinctive, Selective, and Flexible

China's foreign investment strategy is *distinctive* in that it reflects the role of the central government in guiding investments and the broad national priority accorded to sustaining high rates of economic growth. It is also distinctive in the contrast between Chinese investments in recent years and those made in the same period by several prominent global private-equity firms. For example, from 2007 to 2009, five such firms focused their investments on hotels and motels, real estate, construction materials, motor vehicles, and packaged frozen foods. Chinese investments in the same period were concentrated in financial and business services, with smaller stakes in electronics, telecommunications, and medical equipment.

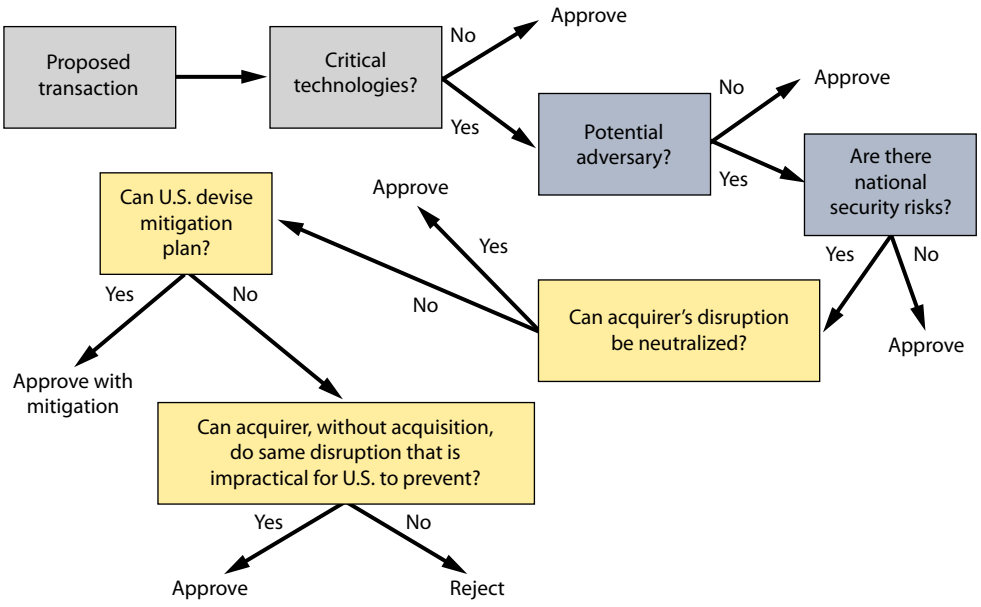
Conspicuous differences between China's investments in the United States and its investments in Europe, Asia, and the rest of the world illustrate the *selectiveness* of China's strategy. In Europe, China's investments have been mainly in minority

acquisitions in multinational oil and gas companies and in business and financial services. In Asia and the rest of the world, China's investments have predominantly targeted resource industries, particularly oil, gas, copper, lead, and zinc. China's U.S. investments have been in U.S. Treasury notes, bills, and other government obligations and, to a lesser degree, in business and financial services. However, the RAND research team expects this pattern to shift away from finance and business services. The reasons for this forecast include China's continued accumulation of large current-account surpluses, emergent opportunities for acquiring a wider range of U.S. companies as a result of their depressed valuations, the expanding needs of the Chinese economy for high technology, and a growing belief by Chinese decision-makers that U.S. receptivity to acquisitions by financially endowed Chinese investors may be somewhat higher than in prior years.

That China's investment strategy is also *flexible* has been suggested in recent policy pronouncements by top Chinese leaders. China's leadership has encouraged expanded investment abroad, especially by companies it judges to be most capable, including state-owned enterprises, while adopting a more restrictive stance toward those judged less capable.

How to Assess Potential Investments by China

China's focus on resource security and its emphasis on investments in resource industries are viewed within China as deriving from the high priority that the leadership accords to economic growth and the presumed requirement for secure supplies of critical materials to sustain this growth. Open to question is whether China's efforts to expand such investments are as likely to benefit as to harm the United States, which is another principal importer of oil, gas, copper, iron, lead, zinc, and other minerals. The researchers recommend using a "wide-angle lens" to view and

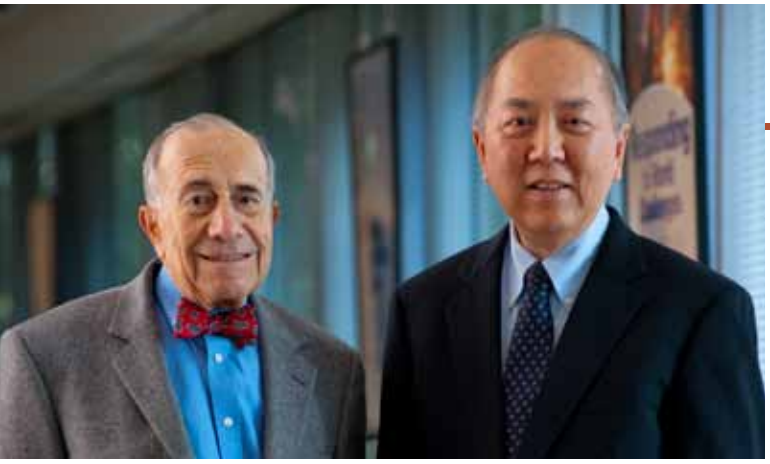


A RAND-developed decision tree helps guide assessments of foreign investments and the potential benefits and risks to national interests.

assess China's investment acquisitions in European and Asian countries as acutely as those in the United States are examined. This wider view will help provide a way of anticipating whether and when a series of Chinese investments might lead to an excessive degree of market power over ores and other resources that might create vulnerabilities for the economy and national security of the United States and other countries.

As to specific investments and their potential effect on national security, the research team devised an analytic methodology that can provide guidelines for further investigation and analysis. The framework is informed by a broad definition of *security* that includes those technologies and services that are pertinent to economic security and growth. The resulting decision tree (shown in the figure) begins with the "proposed transaction" in the upper left corner and proceeds through successive steps to guide an assessment of technology acquisitions, the potential acquirer, national security risk, whether a mitigation plan can abate such risk, and whether the potential acquirer would have ready access to alternatives to achieve the same ends. The United States should recall and invoke the principle of reciprocity in devising mitigation plans to arrive at win-win outcomes while avoiding losses to either party. Reciprocity would require a cooperative and compliant response by China to creative mitigation plans by the United States or other countries for any proposed acquisitions that may entail security risks. The researchers suggest that reciprocity can be invoked without compromising a general preference for open, competitive capital markets. Furthermore, the assessment of risks from an acquisition should be accompanied by a separate assessment of its potential benefits.

Reciprocity would require a cooperative and compliant response by China to creative mitigation plans for acquisitions entailing security risks.



Charles Wolf, Jr., and Brian G. Chow
Project Leaders

For more information, see *China's Expanding Role in Global Mergers and Acquisitions Markets*, Charles Wolf, Jr., Brian G. Chow, Gregory S. Jones, and Scott Harold, MG-1162-CAPP, 2011. Online at www.rand.org/pubs/monographs/MG1162.html

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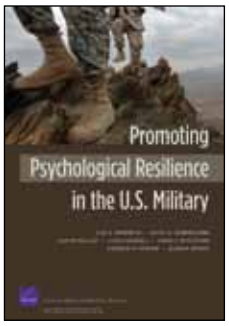

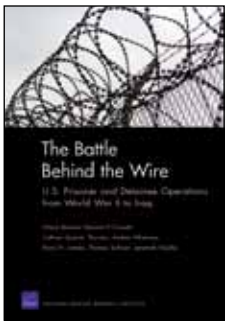

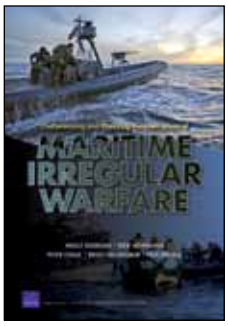

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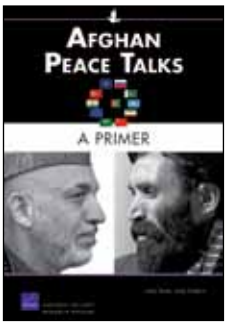

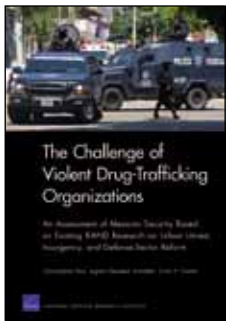

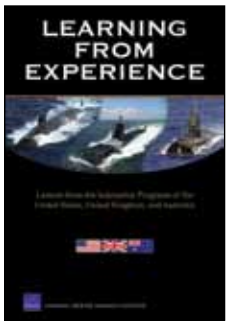

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